PLANT BREEDING ABSTRACTS

Vol. XXVII, No. 1
(Abstracts Nos 1—973)

Compiled from World Literature
by the

COMMONWEALTH BUREAU OF PLANT BREEDING AND GENETICS

1 January, 1957

Commonwealth Agricultural Bureaux,
Farnham Royal, England

TABLE OF CONTENTS

PAGE
Statistics .. 1
Genetics .. 3
Cytology .. 11
Taxonomy .. 16
Economic Lower Plants (*Rhizobium*, *Acetobacter*, *Streptomyces*, *Claviceps*, *Saccharomyces*) .. 16
Crop Plants (including annual reports) 20
Cereals .. 54
Wheat .. 56
Oats .. 74
Rye .. 76
Maize .. 77
Barley .. 85
Millets and Sorghums .. 90
Rice .. 91
Forage Grasses (including general studies of forage plants) .. 95
Leguminous Forage Plants .. 101

Roots and Tubers

Beet .. 106
Swede .. 106
Potato .. 106
Sweet Potato .. 111

Fibres

Cotton .. 112
Flax .. 117
Hemp .. 117
Sisal .. 117
Luffa .. 118

Sugar and Starch Plants

Sugar cane .. 118
Sweet sorghum .. 120
Sugar beet .. 121
Dioscorea .. 122
Colocasia .. 122

PAGE

Stimulants

Tobacco .. 122
Tea .. 123
Coffee .. 124
Cacao .. 124
Hops .. 125
Minor Crop Plants (*Capsicum*, rai, rape, castor oil plant, linseed, sunflower, safflower, *Commelina*, *Althaea*, *Strophanthus*, *Aconitum*, *Valeriana*, *Cassia*, rubber) .. 125
Fruits and Nuts (including general horticultural reports) .. 127
Pome fruits .. 130
Stone fruits .. 132
Citrus fruits .. 133
Fig .. 134
Mulberry .. 134
Annona .. 134
Mango .. 134
Kaki .. 134
Nuts .. 134
Groundnut .. 135
Areca .. 135
Coconut .. 135
Olive .. 136
Soft fruits .. 136
Grape .. 138
Forestry .. 140
Vegetables (including annual reports) .. 141
Allium .. 142
Brassica .. 142
Spinach .. 143
Cucurbits .. 143
Tomato .. 145
Vicia .. 147
Phaseolus .. 147
Vigna .. 147
Soya bean .. 148
Pea .. 149
Cajanus .. 150
Sweet corn .. 150
Popcorn .. 150
Mentha .. 150
Book Reviews .. 150
New Journals .. 170

C. A. B.
22 MAY 1958
FILE

PLANT BREEDING ABSTRACTS

Prepared by the
Commonwealth Bureau of Plant Breeding and Genetics,
School of Agriculture, Cambridge

Volume XXVII, 1957

Commonwealth Agricultural Bureaux, England
1958

© *Commonwealth Agricultural Bureaux,* 1958

Plant Breeding Abstracts

Vol. XXVII, No. 1

C. A. B.
17 JAN 1957

STATISTICS

1 RIDER, P. R.
Truncated binomial and negative binomial distributions.
J. Amer. statist. Ass. 1955 : **50** : 877–83.

Estimates are proposed of the parameter and index of the distributions mentioned when some classes are truncated from one end of the distribution.

2 NOETHER, G. E.
Use of the range instead of the standard deviation.
J. Amer. statist. Ass. 1955 : **50** : 1040–55.

A synopsis and discussion of the use of range in problems concerning means and variances of one or two normal populations are given. Numerous examples are provided.

3 WANG, C.-M.
(New methods for testing the significance of the difference between two sample means).
Taiwan Tahsueh Nunghsuehyuan Yenchiu Paokao/Mem. Coll. Agric. Taiwan Univ. 1955 : **4** : 8–22. [Chinese].

Welch's v test is preferred (cf. *PBA*,* XVII, Abst. 950). The method of application is discussed and extended to cover the case where the samples are not independent.

4 MURTY, V. N.
Short-cut methods in the analysis of variance.
Agric. J. Fiji 1956 : **3** : 123–28.

A method of analysis of variance based on range is described.

5 WANG, C.-M.
(The past and present of tests for the significance of differences between means).
Chunghua Nunghsueh Hui Pao/J. agric. Ass. China 1956 : New Ser. No. 13 : 28–34. [Chinese].

The conditions under which the standard tests for the significance of differences between means can be applied and some recently developed tests for the same purpose are reviewed.

6 GEIDEL, H.
Zur näherungsweisen Berechnung des Schätzwertes des Standardfehlers von Beobachtungsreihen. (**The approximate calculation of the estimated value of the standard error of a series of observations**).
Z. Acker- u. PflBau. 1956 : **101** : 453–58.

The exact method of computing the estimated value of the standard error is compared with the approximate method based on range, and ways in which the inaccuracies inherent in the approximate method can be reduced are considered.

7 BEHRENS, W. U.
Zur abgekürzten Berechnung der Standardabweichung. (**The rapid calculation of the standard deviation**).
Z. Acker- u. PflBau. 1956 : **101** : 459–64.

Approximate methods of calculating the standard deviation from $| x_1 - \bar{x} |$ or the range instead of from $(x_1 - \bar{x})^2$ are compared and discussed.

8 YOUDEN, W. J. & HUNTER, J. S.
Partially replicated latin squares.
Biometrics 1955 : **11** : 399–405.

Latin squares are often used where the rows and columns refer to factors. Analysis is then only possible if interactions do not exist. The authors show how the addition of k extra readings to a $k \times k$ Latin square enables a check to be kept on the interactions. A numerical example is included.

9 THOMPSON, W. A. (JUN.)
The relative size of the inter- and intra-block error in an incomplete block design.
Biometrics 1955 : **11** : 406–26.

Methods of testing hypotheses or making confidence statements about the ratio described in the title are discussed. The general procedure is described in detail and illustrated by two examples, one concerned with varieties of oats. Suitable designs which simplify the procedure are discussed.

---

* *Plant Breeding Abstracts.*

10 Outhwaite, A. D. & Rutherford, A.
Covariance analysis as an alternative to stratification in the control of gradients.
Biometrics 1955 : **11** : 341–40.

Federer and Schlottfeldt discussed the analysis of a randomized block design with 8 blocks and 7 treatments in which there was a fertility trend affecting tobacco plants within the blocks. They used a covariance analysis to eliminate linear and quadratic components of this trend. The present authors continue up to the sixth degree and point out that the design is less efficient than a 7 x 7 Latin square, and suggest a better design. The calculations are given in detail.

11 Kramer, C. L.
On the analysis of variance of a two-way classification with unequal sub-class numbers.
Biometrics 1955 : **11** : 441–52.

A method, for the problem of the title, simpler than the standard one, is proposed and illustrated by an example concerning milk yield of cows.

12 Ditchburne, N.
A method of analysis for a double classification arranged in a triangular table.
Biometrics 1955 : **11** : 453–64.

The situation considered is where there are two classifications at the same number of levels k, n_{ij} observations at the ith level of one and the jth level of the other, and the n_{ij} satisfy: $n_{ij} = 0$ for $i + j > k + 1$; $n_{ij} = n_i$ for all $j \leqslant k - i + 1$ or $n_{ij} = n_i$ for all $i < k - j + 1$. The analysis is illustrated by an example on the buffer capacity of flax after retting.

13 Dunnett, C. W.
A multiple comparison procedure for comparing several treatments with a control.
J. Amer. statist. Ass. 1955 : **50** : 1096–121.

Experiments are considered in which p treatments are tested against a control, giving $p + 1$ means, each based on the same number of readings, and an estimate of error. Tables are provided which enable p statements to be made about the differences between each of the p treatments and the control with overall confidence coefficient 95% or 99%. If the number of readings are unequal the tabulated values are approximate. Two numerical examples are included. The problem of optimum allocation of the results between treatments and control is discussed and it is shown that the number of controls should be approximately $\sqrt{p}$ times the number for each treatment. The tables also provide a means of carrying out a significance test to see whether any one of the treatments is better than the control.

14 Binet, F. E., Leslie, R. T., Weiner, S. & Anderson, R. L.
Analysis of confounded factorial experiments in single replications.
Tech. Bull. NC agric. Exp. Sta. 1955 : No. 113 : Pp. 64.

A method due to Bainbridge for analysis of the above lay-out is described and illustrated by a detailed example of a $3^2 \times 2$ experiment, in 3 blocks of 6 units, on the manuring of cotton. The method determines, firstly, which block contrasts are confounded with treatment contrasts, and secondly enables the effects of treatments (ignoring blocks), the related sums of squares and the estimate of error variance to be calculated. Tables, which enable the first stage to be omitted, are provided for designs (except those of the form 2^n) with not more than 36 units and fewer than 8 levels, and for the additional designs, $4^2 \times 3$, 4^3, 5×3^2 and $3^3 \times 2$.

15 Behrens, W. U.
Die Eignung verschiedener Feldversuchs-Anordnungen zum Ausgleich der Bodenunterschiede. (**The suitability of different layouts for compensating for soil differences**).
Z. Acker- u. PflBau. 1956 : **101** : 243–78.

Various forms of the following layouts are discussed from the point of view of making due allowance for soil heterogeneity: the randomized Latin square, randomized blocks, Youden square, Latin rectangle and systematic Latin square. The effect of plot shape is also considered, long narrow plots being preferred.

16 Finney, D. J. & Nissen, Ø.
Incomplete determination of a measure of quality in a series of experiments.
J. agric. Sci. 1956 : **48** : 124–28.

When performance in field experiments is measured as a product of gross weight and a quality factor, as when dry matter yield is determined from gross yield and percentage dry matter, the factor is usually much less variable than the gross yield. It is urged that it is therefore both unnecessary and uneconomical to estimate the quality factor in every experiment in a series. Proposals are made for determining the quality factor in only a fraction of the experiments in a series and applying the averages to the gross yields of others in the same series. Formulae and tables are presented showing how the most economic ratio of completely recorded to incompletely recorded experiments may be determined.

GENETICS

17 D'Amato, F. & Hoffmann-Ostenhof, O.
Metabolismo e mutazioni spontanie nei vegetali. (**Metabolism and spontaneous mutations in plants**).
Nuovo G. bot. ital. 1954 : **61** : 733–35.

A synopsis in Italian is given of an article summarized in *PBA*, XXVI, p. 696.

18 Sánchez-Monge, E.
Glosario de términos de genética y citogenética. Nuevos términos y usos. IV. (**Glossary of genetical and cytogenetical terms. New terms and uses. IV**).
An. Estac. exp. Aula Dei 1956 : **4** : 266–72.

A further set of additions is published (cf. *PBA*, XXV, Abst. 2561).

19 Coonen, L. P.
Protogenetics from Adam to Athens.
Sci. Mon. NY 1956 : **83** : 57–65.

The author presents an historical review of ideas on inheritance, the transmission of acquired characteristics and pangenesis current in the Ancient World with special reference to the theories propounded by Aristotle and Hippocrates and selection work on crop plants by the American Indians (cf. *PBA*, XXVI, p. 130) and Ancient Egyptians.

20 Zirkle, C.
L'affaire Lysenko: spring 1956.
J. Hered. 1956 : **47** : 47–54.

The history of genetics in the Soviet Union since the initiation of criticism of Lysenko's theories by Turbin in 1952 (cf. *PBA*, XXVI, Abst. 1634) is reviewed.

21 Nei, M.
The test of significance for heritability estimates.
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **5** : 213–18.

Methods of testing the significance of heritability estimates are discussed. A table is provided for testing the significance of the deviation of a heritability estimate from zero when the genetic variance has been estimated from the difference between variances. An example based on data on quantitative inheritance in rice published by Shakudo *et al.* (cf. *PBA*, XXIV, Abst. 1129) is worked out.

22 Kaiser, D.
Coopération de deux mutants d'un bactériophage pour la lysogénisation. (**Cooperation of two mutants of a bacteriophage in lysogeny**).
CR Acad. Sci., Paris 1956 : **242** : 3129–32.

Bacteriophage $\lambda +$ was found to lyse colonies of *Escherichia coli* with a probability of 0·3. From this bacteriophage two mutants, *c* and *co*, were isolated; *c* was nonlysogenic and *co* possessed only negligible lysogenic properties. When, however, colonies of *E. coli* were infected simultaneously with both mutants, 25% of the cells were lysed. It is concluded that the different stages of lysogeny are controlled by separate genes in bacteriophage $\lambda +$ and that each of the two mutants was deficient in a different gene.

23 Fredericq, P. & Betz-Bareau, M.
Influence de diverse propriétés colicinogènes sur la fertilité d'*Escherichia coli.* (**Influence of different colicinogenic properties on the fertility of *E. coli***).
CR Soc. Biol., Paris 1956 : **60** : 615–19.

The progenies of crosses between two colicinogenic strains, each of which produced a different type of colicin, always inherited the colicinogenic properties of the F^- parent and sometimes also those of the F^+ parent; in the latter case the hybrids produced both types of colicin simultaneously. It was shown that the production of colicin reduced the fertility of colicinogenic strains and hybrids.

24 Streisinger, G.
The genetic control of host range and serological specificity in bacteriophages T2 and T4.
Virology 1956 : **2** : 377–87.

The host ranges of phages T2, T4 and T2*h* were found to be determined by alleles at the same locus. These alleles are designated h^{2+}, h^{4+} and h^2 respectively. Differences between T2 and T4 in susceptibility to neutralizing antiserum were genetically inseparable from the differences in host range.

25 Streisinger, G.
Phenotypic mixing of host range and serological specificities in bacteriophages T2 and T4.
Virology 1956 : **2** : 388–98.

"Crosses between h^{2+} (T2 host range) and h^{4+} (T4 host range) phage produce progeny which are phenotypically h^{2+}, h^{4+}, or $h^{2+}h^{4+}$. The proportions of genetically h^{4+} and h^{2+} particles belonging to any one phenotypic class are similar. The host range and serological specificities which are controlled by one genetic locus are also linked phenotypically. It is suggested that the materials responsible for these specificities are produced in a pool and become randomly associated with the genetic material of phage during maturation."

[Author's summary]

26 Appleyard, R. K., McGregor, J. F. & Baird, K. M.

Mutation of extended host range and the occurrence of phenotypic mixing in the temperate coliphage lambda.

Virology 1956 : **2** : 565–74.

The phage arising as the result of mutation from h^+ to h is adsorbed by a bacterial strain which is unable to adsorb the parental h^+ phage. The locus h is linked with other known markers of phage. Considerable phenotypic mixing, corresponding to nearly random association of the h phenotype with the h genotype, has been found among the progeny phage after mixed infection with h and h^+ phage. It is suggested that the h phenotype is a property of the protein coat of the phage, this structure being randomly associated with the genetic elements of the phage. The absence of phenotypic mixing with respect to strong virulence ($v2$) suggests that this marker character is expressed phenotypically through some structure formed inseparably from the corresponding genetic constituents.

27 Magni, G. E.

Problems concerning the radiosensitivity of yeast cells.

CR Lab. Carlsberg 1956 : **26** : 273–84.

A summary is presented of problems in yeast radiogenetics, together with a discussion of methods of quantitative analysis of the different kinds of genetic damage caused by X rays. Expressions are given for the different types of survival curves to be expected with four types of X-ray-induced genetic lethals in unicellular organisms of different degrees of polyploidy, together with a general expression for the survival of a haploid strain in which all four types of genetic lethals occurred. Different sources of biological variability in haploid strains are discussed. Methods of evaluating the frequency of recessive lethals and of determining the relative effects of gene mutations and chromosome deficiencies are described.

28 Dodge, B. O.

New hybrid asci by intercrossing lethal mutant races of *Neurospora tetrasperma.*

CR Lab. Carlsberg 1956 : **26** : 51–69.

An account is given of the methods used to obtain asci containing two of the three lethal genes *I*, *d* and *E*, in the combinations *AaIIee*, *AaIiEe*, *AaEeDd* and *AaEedd*. On new-potato steep dextrose 50% of the homozygous asci *AaII* aborted, whereas very few of the heterozygous *AaIi* did so. Gene *I* differs in this respect from *E* and *d*, both of which cause complete abortion of asci when homozygous. When heterozygous their effect is influenced by cultural conditions (cf. *PBA*, XXVI, Abst. 98).

29 Bennett, J. H.

Modes of tetrad formation.

Amer. Nat. 1956 : **90** : 195–99.

The relationship between number of tetrad genotypes and mode of tetrad formation is discussed (cf. *PBA*, XIII, Abst. 20; XXI, Abst. 23; XXII, Abst. 2503). It is noted that, as the number of linked loci rises, the number of tetrad genotypes relative to the number of modes of tetrad formation rises till almost every mode of formation is able to give rise to tetrads of two different genotypes.

30 Harm, W.

On the mechanism of multiplicity reactivation in bacteriophage.

Virology 1956 : **2** : 559–64.

Comparative data on the survival of multicomplexes of ultraviolet-inactivated phage adsorbed by bacterial populations having the usual variability in cell size and by populations in which variability in size had been considerably reduced as the consequence of the elimination of the filamentous cells indicated that deviations from the expectations of the recombination theory of multiplicity reactivation cannot be attributed to variability in host-cell size, as suggested by Cairns and Watson (cf. *PBA*, XXVI, Abst. 2054).

31 Weigle, J. J. & Bertani, G.

Multiplicity reactivation of bacteriophage inactivated by ionizing radiations.

Virology 1956 : **2** : 344–55.

Highly efficient multiplicity reactivation was obtained under certain conditions with phage inactivated by γ or X rays. The aspects discussed include the bearing of this result upon the genetical nature of multiplicity reactivation.

32 Holloway, B. W.

Self-fertility in *Pseudomonas aeruginosa.*

J. gen. Microbiol. 1956 : **15** : 221–24.

"Two interfertile strains of *Pseudomonas aeruginosa* were re-examined for evidence of self-fertility. One strain was self-fertile, the frequency of recombination being affected by the manner in which the parent organisms were grown before being combined. The other strain gave no evidence of self-fertility." [Cf. *PBA*, XXVI, Abst. 909]. [Author's summary].

33 Emerson, S.

Notes on the identification of different causes of aberrant tetrad ratios in *Saccharomyces.*

CR Lab. Carlsberg 1956 : **26** : 71–86.

Six possible causes of aberrant tetrad ratios are discussed, namely (*a*) genic interaction, (*b*) polyploidy and polysomy, (*c*) somatic crossing over, (*d*) aberrant nuclear behaviour, (*e*) spontaneous gene mutation and (*f*) gene conversion. These causes are not all equally important or equally prevalent in all strains. Gene conversion is thought to be the most important in relation to current genetic thinking.

34 Fowell, R. R.

Anomalous inheritance of tryptophane genes in *Saccharomyces cerevisiae.*

CR Lab. Carlsberg 1956 : **26** : 117–38.

Several crosses were made between a tryptophane-requiring haploid of strain DCL 369 and two tryptophane independents, and the resulting hybrids subjected to tetrad analysis in respect of tryptophane synthesis. In most cases 2 : 2 segregations were found, but one hybrid was characterized by a predominance of 4 : 0 segregations. The results recorded for this hybrid cannot be explained on the basis of the usual theories. It shows a pronounced tendency to form asci with supernumerary spores and it is suggested that intra-ascal competition between genotypes in these asci would account for the 4 : 0 segregations and the absence of 3 : 1 ratios.

35 Shult, E. E. & Lindegren, C. C.

Mapping methods in tetrad analysis. I. Provisional arrangement and ordering of loci preliminary to map construction by analysis of tetrad distribution.

Genetica 1956 : **28** : 165–76.

The frequency distributions of original, recombinant and tetratype tetrads of *AB* x *ab* matings fall into nine principal classes. The information provided by these various classes with regard to gene location and interference is discussed.

36 Sansome, E.

Crossing over in fungi, bacteria, bacteriophage and higher organisms.

CR Lab. Carlsberg 1956 : **26** : 315–33.

A review is given of work with *Neurospora*, maize, *Drosophila*, various bacteria, bacteriophage and spore tetrads of *Funaria* and some algae, and the results discussed on the basis of crossing over. To account for some results in *Neurospora* and maize it is suggested that the process of crossing over often results from two breaks very close together, giving a proportion of double crossovers which are only detectable when very short regions are marked. Such double crossing over appears to be frequent in bacteria and the association of heterozygotes with recombination in bacteriophage can be explained on the assumption of two divergent exchanges. It is concluded that if the two-break hypothesis of crossing over is applied to bacteriophage, bacteria and higher organisms then the difference in size of the region between the breaks, as measured in cross-over units, probably reflects a decrease in crossing over per physical unit in higher organisms as compared with bacteriophage and bacteria.

37 Whitehouse, H. L. K.

The use of loosely-linked genes to estimate chromatid interference by tetrad analysis.

CR Lab. Carlsberg 1956 : **26** : 407–22.

A method is described by means of which allowance can be made for the occurrence of double crossovers between marker genes by the analysis of unordered tetrads, when making studies of the strand relationships of successive crossovers in a chromosome. The method depends on the recognition of certain types of tetrads which require a minimum of three crossovers for their formation, and data on the relative frequency of different strand relationships can be obtained using loci showing only slight linkage. Data obtained from studies of *Neurospora sitophila* have been analysed by this method, the results indicating the occurrence of a significantly high proportion of two-strand relationships between cross overs.

38 Elliott, C. G.

Variation in chiasma frequency with special reference to the effect of temperature.

Abstr. Diss. Univ. Camb. 1953–1954 (1955) : 20–21.

In *Hyacinthus orientalis*, chiasma frequency was greatly reduced at 5° and 10° C. compared with the frequency at 15° and 20° C. while in *Endymion nonscriptus* chiasma frequency was unchanged over the range 1–15° C. but was reduced at 20° C.; in both species the reduction resulted from failure of pairing of chromosomes. In these and other species, including *Secale cereale* and *Triticum monococcum*, individual plants differed in mean chiasma frequency, the differences being genetically controlled in *Triticum*.

39 Winge, Ö.
On interallelic crossing over.
CR Lab. Carlsberg; Sér. Physiol. 1955 : **25** : 341–54.

This paper has already been summarized from another source (cf. *PBA*, XXVI, Abst. 1952).

40 Catcheside, D. G.
Genes—their nature and function.
CR Lab. Carlsberg 1956 : **26** : 31–39.

Recent theories of the nature and function of genes are discussed. It is suggested that each gene gives rise to a characteristic product, here called a plasmid, which is liberated into the cytoplasm. These plasmids are organized into complexes, whose composition affects the activity of their constituent plasmids. The action and interaction of genes would thus be brought about by the interaction of their plasmids in the cytoplasm.

41 Lindegren, C. C.
Stability of the gene.
Science 1956 : **124** : 26–27.

The author suggests that in interpreting irregular Mendelian ratios geneticists are prejudiced by the classical concept of the stability of the gene. He discusses the genic instability he has observed in yeast and his hypothesis of gene conversion, pointing out that although geneticists have been reluctant to accept this concept they have accepted the evidence of transduction and transformation, which may be regarded as gene conversion mediated indirectly by viruses and chemical substances. Deviations in penetrance may also involve gene conversion.

42 Pontecorvo, G. & Roper, J. A.
Resolving power of genetic analysis.
Nature, Lond. 1956 : **178** : 83–84.

Pontecorvo, G. & Roper, J. A.
Resolving power of genetic analysis in terms of DNA.
Heredity 1956 : **10** : p. 124. (Abst.).

With reference to crossing over in *Aspergillus*, *Drosophila* and phage T4, examples are given of a very high order of resolution between sites in allelic "sections" in which more than two mutational sites have been identified. Analysis of these examples suggests that the number of mutational sites within an allelic section, separable from one another by crossing over, may run into high numbers. The smallest recombination fractions so far measured represent less than one-millionth of the total genetic map. Applying Benzer's hypothesis (cf. *PBA*, XXVI, Abst. 977), it is calculated that the numbers of nucleotide pairs corresponding to the smallest recombination fractions measured are 8, 216 and 12 for *Aspergillus*, *Drosophila* and phage T4 respectively, and that the minimum number of nucleotide pairs per section of allelism is of the order of 1000–8000 in all three organisms.

43 Hirota, Y.
Artificial elimination of the *F* factor in *Bact. coli* K–12.
Nature, Lond. 1956 : **178** : p. 92.

Cells of the F^- type were obtained from F^+ cells by treatment with a cobalt or nickel salt. This conversion is termed *F* elimination. The data indicated that (1) *F* elimination occurred even in the absence of cell division, (2) the frequency of *F* elimination was about 100,000 times greater that that of other bacterial mutants, (3) F^+ and F^- strains were equally susceptible to the killing effect of Co or Ni and (4) the F^- trait was not associated with the resistance of strains to Co or Ni. Possibly the *F* agent is extruded on to the surface of F^+ cells at a certain stage of its life cycle, its sensitivity to Co or Ni in this condition being greater than that of nuclear genes or of other cytoplasmic factors.

44 Zamenhof, S., Leidy, G., Eros, H. & Alexander, H. E.
Inactivation and unstabilization of the transforming principle by mutagenic agents.
J. Bact. 1956 : **72** : 1–11.

The transforming principle of *Haemophilus influenzae* could be inactivated by very small doses of ultraviolet radiation, nitrogen mustards, other alkylating agents, ascorbic acid or 1,5-diaminobiuret, suggesting that DNA is the site of action of these mutagenic agents. The evidence indicated that the direct effect of the mutagens *in vitro* on the transforming principle prior to inactivation was the change of the latter into an unstable form. The possible relationship between inactivation and gene mutation is discussed.

45 Fluke, D. J. & Marmur, J.
A comparative study of ionizing radiation action on several transforming factors of pneumococcus.
Rad. Res. 1955 : **3** : p. 225. (Abst.).

"Preparations of transforming pneumococcal deoxyribonucleic acid have been bombarded with 2-Mev electrons and tested for remaining transforming activity with respect to three drug-resistant factors and one metabolic factor. The results show no difference in radiation effect among these four factors. There appears to be a mixture of radiation sensitivities of transforming activity describable in terms of two radiosensitive molecular weights, one smaller than 1,000,000 and the other larger than 2,000,000. There is also indication that linked transforming factors involve mainly the higher sensitivity."

46 Drew, R. M.
γ-irradiation of pneumococcus deoxyribonucleic acid.
Rad. Res. 1955 : **3** : 116–20.

The transforming principle of pneumococcus type III DNA was completely inactivated by γ irradiation in saline. A much higher tolerance was shown when the DNA was irradiated in cysteine solution, a dose of 100,000 rep. having no effect upon the transforming activity of 100-μg. amounts of the DNA. A dose of 250,000 rep. was not sufficient to destroy all the transforming principle of 50μg. portions.

47 Ting, R. C. Y. & Plough, H. H.
Radiation inactivation of temperate Salmonella bacteriophage without loss of transduction potency.
Rad. Res. 1955 : **3** : p. 354. (Abst.).

Exposure to 320,000 r. of γ radiation from Co^{60} reduced the survival of the phage to 10% but did not alter the frequency of transduction. This suggests that only absorption and not reproduction of the phage is required to effect transduction.

48 Till, J. E. & Pollard, E.
Cross reactivation of deuteron bombarded T1 bacteriophage.
Arch. Biochem. Biophys. 1956 : **63** : 260–62.

Experiments on double infection of *Escherichia coli* involving phage irradiated *in vacuo* with deuterons have suggested that 60% of the genetic part of the phage is all that is essential for cross reactivation. More detailed irradiation experiments are in progress to calculate the length and diameter of the genetic fraction required for cross reactivation.

49 Fredericq, P.
Genetic transfer of colicinogenic properties by *Bact. coli.*
J. gen. Microbiol. 1956 : **15** : No. 1 : p. iii. (Abst.).

Colicinogenic properties have been transduced from F$^+$ to F$^-$ strains, as the result of cell conjugation instead of through the mediation of phage. The transfer of such properties is not accompanied by that of other known markers. The capacity to produce colicin is always transmitted to recombinants when carried by the F$^-$ parent but only sometimes when carried by the F$^+$ parent. Transmission of colicin production is associated with decreased fertility in varying degrees according to the type of colicin; this decrease is more pronounced when the F$^+$ strain constitutes the parent and in some cases complete sterility of the recombinants may occur.

50 Furness, G. & Rowley, D.
Transduction of virulence within the species *Salmonella typhimurium.*
J. gen. Microbiol. 1956 : **15** : 140–45.

Virulence to mice and adenine independence were transduced by phage to two avirulent and adenine-dependent strains. Another adenine-dependent strain was transduced with respect to streptomycin resistance but not adenine independence or virulence. Streptomycin resistance but not virulence was transferred to a fourth prototrophic and antigenically typical strain. Prototrophs obtained by transduction and selection *in vitro* were also virulent; the avirulence of the auxotrophic strains was therefore due to lack of supply of a nutritional requirement in the tissue fluids of the mouse. Possible genetic causes of the failure to transduce the third and fourth strains for prototrophy and virulence respectively are briefly suggested.

51 Maccacaro, G. A. & Colombo, C.
Antigens and mating types in *Escherichia coli.*
Nature, Lond. 1956 : **178** : p. 421.

Data have been obtained suggesting that F$^+$ and F$^-$ cells of the same phenotype may differ in surface antigens (cf. Abst. 109).

52 Danielli, J. F.
Cytoplasmic inheritance.
Nature, Lond. 1956 : **178** : 214–15.

The author suggests that all determinants of cytoplasmic inheritance should be referred to as homeostats. "A homeostat may be defined as an organisation of macromolecules, or of processes, which is self-reproducing and which may also (and usually does) determine and control the expression of one or more characters in a cell lineage."

53 SIMONSEN, D. H. & VAN WAGTENDONK, W. J.
The succinoxidase system of killer and sensitive stocks of *Paramecium aurelia*, variety 4.
J. gen. Microbiol. 1956 : **15** : 39–46.

Killer paramecia contain an active succinoxidase system which is absent, or present in only small concentrations, in sensitive phenotypes. This system may therefore be directly associated with κ particles.

54 CAIN, A. J. & SHEPPARD, P. M.
Adaptive and selective value.
Amer. Nat. 1956 : **90** : 202–03.

In reply to some criticisms by Li (cf. *PBA*, XXVI, Abst. 850), the authors reaffirm their opinion that the use of adaptive value for selective value is leading to serious confusion in population genetics.

55 KIMURA, M.
Rules for testing stability of a selective polymorphism.
Proc. nat. Acad. Sci. USA 1956 : **42** : 336–40.

It is shown that the necessary and sufficient conditions for the maintenance of n alleles in stable equilibrium are that the quadratic form $T = \sum_{i=1}^{n-1} \sum_{j=1}^{n-1} t_{ij}\delta x_i \delta x_j$ should be negative definite and that $(-1)^{n-1}\Delta_i > 0$ for all $i = 1, 2, \ldots n$; x_i represents the frequency of allele A_i, $t_{ij} = a_{ij} - a_{in} - a_{jn} + a_{nn}$, a_i being the average excess of A_i. The extension of the rule to multiple loci is illustrated. Random mating and constant genotypic selective values are assumed.

56 WAINWRIGHT, L. K.
Spontaneous mutation in stored spores of a *Streptomyces* sp.
J. gen. Microbiol. 1956 : **14** : 533–44.

In nondividing asexual spores stored at 4° C. and allowed to germinate at 27° C., the mutation frequency increased with the length of the storage period. Variations in the temperature and duration of a prestorage period influenced the mutation rate but poststorage temperature, temperature shocks and various other treatments were without effect. The data indicate that mutations may occur in the absence of nuclear division and that the mutation rate is a function of the physiological condition of the spore and unrelated to the nuclear stage or nuclear number.

57 LINDEGREN, C. C.
Mutation and other variations in microorganisms.
CR Lab. Carlsberg 1956 : **26** : 253–71.

Examples are discussed of mutations and nongenic variations in yeasts and *Neurospora*. Discontinuous nongenic variations are thought to be due to the loss of autonomous nongenic structures or particles, which can be restored by fusion with normal cells. Since such variations may occur spontaneously or may be induced by ultraviolet irradiation, but not by X rays, it is suggested that the structures or particles involved contain ribonucleoprotein. Many nongenic variants are respiratory deficient, indicating that the autonomous particles contain the respiratory apparatus.

In heterozygous diploid cultures, the heterozygote mutates to the homozygous recessive by ultraviolet treatment more readily than the haploid, suggesting that the heterozygous condition facilitates the mutation, but the rate of mutation varies in a given population, depending on the characteristics of the clone. Since mutations may be effected by exposure to substrate it is suggested that the gene is an adaptable structure. Directed mutations of this kind do not usually involve new capacities beyond the range of the genus, but are confined to the limits already established by other members of the genus. The *MZ* locus is of particular interest in this context, since it produces an adaptive enzyme elicited by five different substrates. Multiple alleles of *MZ* may be produced by gene conversion, ultraviolet irradiation and in some cases by exposure to substrate.

58 ROMAN, H.
A system selective for mutations affecting the synthesis of adenine in yeast.
CR Lab. Carlsberg 1956 : **26** : 299–314.

By making use of a system in which there is a selection for mutations affecting the synthesis of adenine and the production of red pigment, 81 mutations have been obtained, distributed between five loci not including *ad* 1 and *ad* 2. Multiple alleles, determining pink colour, occur at four of the five loci and one of the mutant genes, *ad* **3**, also affects the synthesis of histidine. Investigations of the linkage relationships of the mutant genes show that *ad* 5 and *ad* 7 are closely linked and loss of both simultaneously occurs more frequently than loss of either alone; *ad* 3 and *ad* 6 are on the same chromosome, the probable order being centromere – *ad* 6 – *ad* 3;

ad 4 and *ad* 5 are probably on different chromosomes. Evidence is given for the occurrence of somatic crossing over in yeast.

59 JACOB, F. & WOLLMAN, E. L.
Recombination génétique et mutants de fertilité chez *Escherichia coli*. (**Genetic recombination and fertility mutants in *E. coli***).
CR Acad. Sci., Paris 1956 : **242** : 303–06.

The high percentage of genetic recombination sometimes found in crosses between F+ and F− strains of *E. coli* appears to be due to the occurrence of mutants in the F+ culture that lend themselves more readily to recombination than the nonmutant parent strain. Methods of selecting these mutants, which are designated Hfr, are outlined.

60 PIROVANO, A.
Radiazioni ed isotopi in genetica e in biologia. (**Radiations and isotopes in genetics and biology**).
Sementi elette 1956 : **2** : No. 6 : 8–14.

Examples are given of mutations induced by the author with alternating magnetic fields. This method is compared with mutagenesis induced by X rays and radioactive isotopes, which are believed to be too violent methods for optimum results.

61 CHRISTENSEN, J. J.
Mutagenic effects of antibiotics.
Proc. Ist Internat. Conf. Antibiotics Agric.: Publ. Nat. Acad. Sci. Nat. Res. Counc., Washington 1956 : No. 397 : 73–78.

Literature on the role of mixed populations, adaptation and mutation in the origin of variants of bacteria and fungi resistant to antibiotics is reviewed and the potentialities of the use of antibiotics as mutagenic agents in investigating variation in microorganisms are indicated.

62 COUGHLIN, C. A. & ADELBERG, E. A.
Bacterial mutation induced by thymine starvation.
Nature, Lond. 1956 : **178** : 531–32.

Thymine starvation of a strain of *Escherichia coli* requiring both thymine and histidine for growth induced histidine-independent mutants.

63 LITMAN, R. M. & PARDEE, A. B.
Production of bacteriophage mutants by a disturbance of deoxyribonucleic acid metabolism.
Nature, Lond. 1956 : **178** : 529–31.

Plaque mutants were induced by 5-bromouracil in the presence of sulphanilamide, as a result, it is suggested, of disturbance in the metabolism or structure of deoxyribonucleic acid.

64 HOLLAENDER, A., BILLEN, D. & DOUDNEY, C. O.
The modification of X-ray-induced mutations in *Escherichia coli* by pre- and post-treatment.
Rad. Res. 1955 : **3** : p. 235. (Abst.).

The results of experiments on three strains requiring tyrosine, proline and phenylalanine respectively suggested that the rate of X-ray-induced mutation, when modified by certain treatments before or after irradiation, is not entirely dependent upon the dose but inversely related to the number of colony-forming organisms. The experiments referred to dealt with the effects of the following upon survival and relative rate of reversion: (1) absence of oxygen before treatment, (2) pretreatment with cysteamine with and without a supplementary nutrient supply subsequent to irradiation and (3) incubation at different temperatures after irradiation.

65 SRB, A. M.
Spontaneous and chemically-induced mutations giving rise to canavanine resistance in yeast.
CR Lab. Carlsberg 1956 : **26** : 363–80.

Preliminary studies have been made of the production of canavanine-resistant mutations by β-propiolactone. On the evidence of one cross it appears that canavanine resistance is recessive, since analysis of asci produced by a cross between a resistant mutant and a sensitive strain gave 2 : 2 segregations for resistance : sensitivity. After treatment with β-propiolactone some sensitive heterozygous diploids gave a higher frequency of resistant mutants than haploid or homozygous diploid sensitive strains. Only slight mutagenic activity was shown by γ-butyrolactone and γ-valerolactone.

66 MATHEWS, M. M.
White mutants of *Serratia marcescens*. A study of physiological and morphological characteristics.
J. Hered. 1956 : **47** : 85–87.

White mutants obtained from a red strain of *S. marcescens* by irradiation and by growing in autoclaved broth cultures of other organisms differed slightly in microscopic appearance from the parental form, were slightly more resistant to streptomycin and had a higher rate of respiration. Except for the difference in pigmentation, the parental and mutant colonies were similar in appearance.

67 MARKERT, C. L.
Response of *Glomerella* conidia to irradiation by X-rays and fast neutrons.
Pap. Mich. Acad. Sci. 1955 : **41** : 27–41.

Data on lethal and viable visible mutations obtained by exposing conidia to X rays ranging in dose from 10,000 r. to 200,000 r. or to fast neutrons ranging from 27,607 rep. to 133,000 rep. could be interpreted satisfactorily according to the target theory (cf. *PBA*, XXI, Abst. 1568). It is estimated that *Glomerella* carries about 1000 genes in which a single ionizing particle can produce a lethal change and that the probability of lethal change as against a viable visible mutation is nearly 20 to 1 with X rays and about 7 to 1 with fast neutrons. For doses with equal lethal effect, neutron irradiation produces more than three times as many viable visible mutants as X irradiation.

68 ATWOOD, K. C. & PITTINGER, T.
X-ray-induced mutations in growing mycelium of Neurospora.
Rad. Res. 1955 : **3** : p. 212. (Abst.).

When recessive mutations are induced in the nuclei of actively growing mycelia, descendants of the mutant nuclei are carried forward as the result of continued growth and may be recovered in conidia formed at a considerable distance from the site of induction. Doses up to 50,000 r. have no permanent effect on the growth rate of the mycelium. Nuclei with induced dominant lethals are not carried forward. Usually about 30% of the recessive lethals are lost during the early stages of growth. A majority of the recessive lethals, however, persist in at least 400 mm. of mycelial growth. Repeated irradiation, with intervals of growth between treatments, results in the accumulation of recessive lethals. A single dose of 50,000 r. induces about 5% mutant nuclei. After selection has been taken into account, the rate of mutation induced in growing cultures is lower than that induced in conidia.

69 DITLEVSEN, E. & HARTELIUS, V.
A "gigas" mutant in *Schizosaccharomyces pombe* induced by X-rays.
CR Lab. Carlsberg 1956 : **26** : 41–48.

An X-ray induced mutant is described, whose linear dimensions are more than twice those of normal yeast cells. It is probably diploid and of mating type — with one mating type gene inactivated.

70 BURDICK, A. B.
Mutagenic effect of thermal neutrons on wet and dry tomato seed.
Nature, Lond. 1956 : **178** : 360–61.

In the progeny of plants raised from dry irradiated seed of *L. pimpinellifolium* the frequency of mutation was much higher than in the progeny of plants derived from saturated treated seeds. Tomato seeds are able to withstand considerably higher doses of thermal neutrons than barley seeds. The data suggested that the resistance of tomato seeds is cytoplasmic in origin and that genetic damage increased as an approximately linear function of dose in spite of somatic protection.

71 LABRUM, E. L. & OVADIA, J.
Relative biologic effectiveness of 22.5-Mev and 180-kv X-rays on *Escherichia coli* strain B/r.
Rad. Res. 1955 : **3** : p. 334. (Abst.).

A linear relationship was found between increase in X-ray dose and frequency of reversion from streptomycin dependence to independence. No significant difference was detected between the mutagenic effects of 22.5 Mev and 180 kv X rays.

72 MITCHELL, M. B.
A consideration of aberrant recombination in Neurospora.
CR Lab. Carlsberg 1956 : **26** : 285–98.

Further studies of three pyridoxine-requiring mutants have been made (cf. *PBA*, XXVI, Abst. 946–7) during which a high frequency of mutations to wild type at meiosis has been found in crosses of each of the mutants to wild, and in *pdx* x *pdxp* and *pdxq* x *pdxp* but not in *pdx* x *pdxq* nor when the mutants were crossed with themselves. An association is suggested between meiotic mutations and crossing over at the pyridoxine locus, on the basis of the correspondence between the frequencies of cross-over and non-cross-over classes of wild individuals among random spore isolates from the intercrosses, and also the correlation of map distance in the region *pyr* 1 to *co* with the frequency of the apparent double cross-over type, which may arise largely by mutation from the mutant x wild crosses.

Two of the heterocaryons, *pdxp* with *pdx* or *pdxq*, are pyridoxine independent, while the third, *pdx* with *pdxq*, is only slightly less dependent than *pdxq* alone. A possible explanation may be that mutations at the pyridoxine locus have introduced different alterations in the same enzyme, and that in a heterocaryon a mixture of two altered forms of this enzyme is present.

73 Kølmark, G.
Mutagenic properties of certain esters of inorganic acids investigated by the Neurospora back-mutation test.
CR Lab. Carlsberg 1956 : **26** : 205–20.

In a comparative study of the effect of alkyl sulphates, sulphites, phosphates and phosphites and of methyl iodide on an adenineless inositolless double mutant of *N. crassa* only the methyl, ethyl and propyl sulphates were found to be mutagenic. All of these induced more reversions in the adenine locus than in the inositol locus, but the proportions varied for different mutagens. It is suggested that the mutagenic effect of the sulphates as opposed to the sulphites may be explained by the stronger positive charge on the carbonium ion; a comparable explanation has already been made for some monofunctional epoxides (cf. *PBA*, XXVI, Abst. 2027). The present information about the relative specificity of various mutagens against the two loci is summarized and discussed.

74 Anderson, E. S. & Fraser, A.
The statistical distribution of phenotypically modifiable particles and host-range mutants in populations of Vi-phage II.
J. gen. Microbiol. 1956 : **15** : 225–39.

Three types of adaptation of Vi-phage II to type A of *Salmonella typhi* were detected. Fluctuation tests showed that phage E1 particles conformed to a Poisson distribution; this phage reverted to phage A during a single cycle of growth in host type A and is therefore a phenotypic modification. Phage D1 was unaltered by a single cycle of propagation in host type A and is a mutant. Phage 29 behaved as a host-range mutant.

75 Zavadskiĭ, K. M.
(The scientific inheritance left by I. V. Mičurin and some problems of biology).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 3–22. [Russian].

An appreciative account of Mičurin's concepts of variability, heredity, selection and the origin of species is given.

76 Lysenko, T. D.
(Mičurinist theory).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1955 : No. 22 : 5–14. [Russian].

A recapitulation of the author's views on inheritance is given.

77 Sukačev, V. N.
(Interspecific relations in the vegetable world).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1956 : No. 2 : 5–20. [Russian].

Darwin's theory, excepting the thesis that intraspecific competition is always sharper than competition between different species, is accepted and the rival theory by Lysenko, supported in recent years by Platonov, Novinskiĭ, Kaganov and Prezent, is rejected.

CYTOLOGY

78 Ishitani, G., Uchida, K. & Ikeda, Y.
The relation of DNA content to cell size in *Aspergillus*.
Exp. Cell Res. 1956 : **10** : 737–40.

The constancy of the DNA-cytoplasmic ratio in *A. sojae* heterocaryons, in which the average number of haploid nuclei per conidium is greater than in homocaryons and in which the conidial volume is correspondingly increased, may be maintained, it is suggested, by either reduction of nuclear number or increase in cell volume.

79 Jinks, J. L.
Naturally occurring cytoplasmic changes in fungi.
CR Lab. Carlsberg 1956 : **26** : 183–203.

A method is described by means of which it is possible to separate phenotypic changes caused by nuclear mutation from those caused by changes in the cytoplasm, using the properties of heterocaryosis. Three methods of propagation, by hyphal tips, asexual spores and sexual spores gave three distinct frequencies of cytoplasmic variation, which are thought to be related to the behaviour and condition of the cytoplasm at cell division and differentiation. Observations on aging, senescence and "rejuvenation" in *Penicillium cyclopium*, *Aspergillus nidulans* and *A. glaucus* are discussed. (Cf. *PBA*, XXV, Abst. 727).

80 Donohue, J.
Hydrogen-bonded helical configurations of polynucleotides.
Proc. nat. Acad. Sci. USA 1956 : **42** : 60–65.

A study is made of possible two-strand helical polynucleotide structures from which it emerges that other types of base pairing than the one proposed by Watson and Crick (cf. *PBA*, XXIV, Abst. 57) are theoretically possible.

81 Yuasa, A.
(Bacterial nuclei).
Senshokutai (Chromosome)/Kromosomo 1956 : 991–97. [Japanese].

Recent theories on the morphology of bacterial nuclei and their behaviour during division are reviewed.

82 Tandler, C. J.
An acid-soluble component of the nucleolus; the cytochemical specificity of the "lead acetate reaction."
J. Histochem. Cytochem. 1956 : **4** : 331–40.

A specific compound resembling inorganic orthophosphate has been found in the nucleoli of root tips of *Allium cepa* (cf. *PBA*, XXIII, Abst. 919).

83 Kacser, H.
Molecular organization of genetic material.
Science 1956 : **124** : 151–54.

It is suggested that genetical specificity resides in the protected internal surface of an adsorption complex formed by contiguous protein and nucleic acid molecules. The unprotected external surface of the complex is regarded as denatured and nonspecific. Duplication is envisaged to occur by the complementary adsorption of aminoacids on the nucleic-acid surface and nucleotides on the protein surface, this process starting at one end of the interface and proceeding zip-wise along it. In this way two interfaces will be formed instead of the original one, but each structurally identical with it.

84 Pelc, S. R. & Howard, A.
Effect of various doses of X-rays on the number of cells synthesizing deoxyribonucleic acid.
Rad. Res. 1955 : **3** : 135–42.

The number of cells synthesizing DNA (indicated by means of autoradiographs as uptake of P^{32}) in root meristems of *Vicia faba* was reduced by moderate doses of X rays to about 60% of the normal number 12 hours after irradiation. The reduction was of the same magnitude for doses of 50–200 r. This result is ascribed to a greater radiosensitivity to delay or inhibition of DNA synthesis in cells in the first part of interphase, compared with cells at other stages (cf. *PBA*, XXIII, p. 660).

85 Levinthal, C.
The mechanism of DNA replication and genetic recombination in phage.
Proc. nat. Acad. Sci. USA 1956 : **42** : 394–404.

"The experiments reported here suggest that the phage T2 contains in one large piece approximately 40 per cent of its DNA. This piece of DNA probably contains the genetic markers so far mapped, and it replicates to produce particles, each of which contains about half its atoms, but no further distributions of the original atoms take place with further replication. We have no information as to the size and function of the small pieces, except that each of them is less than about 8 per cent of the total in the phage. Thus we conclude that the large piece of DNA probably replicates in the complementary manner suggested by Crick and Watson and that genetic recombination takes place by the formation of phage particles."
[Author's summary]

86 Sparrow, A. H.
A survey of the radiosensitivity of some higher plants.
Rad. Res. 1955 : **3** : p. 349. (Abst.).

A study was made of the sensitivity of 110 different species, representing 35 families, to treatment with acute X and γ radiation or chronic γ radiation from Co^{60}. In general, closely related plants of similar chromosome number showed about the same degree of radiosensitivity but within some genera, e.g. *Chrysanthemum*, *Sedum* and *Luzula*, considerable differences were detected. The most tolerant species were usually those with a medium or high degree of polyploidy and relatively small chromosomes and the least tolerant those with large chromosomes. In certain genera however radiosensitivity was not correlated with chromosome size or number; possibly some physiological or biochemical property may account for the extreme sensitivity or tolerance of some species. Taxonomic relationships showed some correlation with reaction to radiation; several genera belonging to the Solanaceae had for instance about the same degree of tolerance.

87 Arun Kumar Sharma
Improvements in chromosome fixation.
Sci. & Cult. 1956 : **21** : 648–50.

General improvements made during the last few years in fixing and staining procedures for studying chromosome structure in plants are commented upon, chiefly with reference to the work of the author and his colleagues.

88 Tjio, J. H. & Levan, A.
An interesting formation of one satellited chromosome in an individual of *Allium cepa*.
An. Estac. exp. Aula Dei 1956 : **4** : 185–90.

One of the chromosomes in the root-tip cells of a single plant of *A. cepa* had a normally stainable satellite attached to the shorter arm. Its homologue had a satellite zone normal with respect to size and fibre attachment but having only very weakly stainable material. It was often observed at anaphase that the normal satellite was divided into two daughter granules.

89 BUXTON, E. W.
Heterokaryosis and parasexual recombination in pathogenic strains of *Fusarium oxysporum*.
J. gen. Microbiol. 1956 : **15** : 133–39.

A detailed report is given of investigations referred to in *PBA*, XXVI, Abst. 3058.

90 BRADLEY, S. G. & LEDERBERG, J.
Heterokaryosis in Streptomyces.
J. Bact. 1956 : **72** : 219–25.

Evidence of the occurrence of heterocaryosis in the mycelium of strains of *S. griseus* and *S. cyaneus* is presented. Upon sporulation the heterocaryons dissociate into the parental types, no recombinants being formed.

91 ARUN KUMAR SHARMA & BHATTACHARYYA, N. K.
An investigation on the possibilities of the use of phenols in chromosome analysis.
Genetica 1956 : **28** : 121–42.

Tests were carried out on the value of pretreatments with resorcinol, phloroglucinol, hydroquinone, pyrogallol and guaiacol in caryotype analysis, using *Crinum* spp., *Allium cepa*, *Vicia sativa*, *Lathyrus sativus* and other flowering plants. Only guaiacol gave unsatisfactory results. The lower-threshold, upper-threshold and optimum concentrations were determined for each of the first four of the above phenols. Concentrations above the upper threshold caused chromosome abnormalities; the optimum concentrations were far below concentrations having a narcotic effect. Treatment at 10–14° C. was necessary, except in the case of resorcinol which produced equally good results at room and low temperatures. Treatments for the preparation of temporary and permanent smears and of paraffin blocks are described, temporary phenol-aceto-orcein squashes being the most satisfactory. The secondary constriction responded in a characteristic way to phenol treatment, suggesting that this region is chemically specialized. As a means of facilitating the study of chromosome structure, phenol treatment was more effective in the monocotyledons than in the dicotyledons.

92 GUTTMAN, R.
Effects of kinetin on cell division, with special reference to initiation and duration of mitosis.
Chromosoma 1956 : **8** : 341–50.

The effects upon onion root-tip cells of different concentrations of kinetin (6-furfurylaminopurine) isolated from yeast extract and from various DNA preparations were studied. Polyploidy and pycnosis were induced at concentrations of 3 and 5 ppm. At 1 ppm. a small number of binucleate cells was observed after 24 hours' treatment but no aberrations of cell division were observed at this or at lower concentrations. Concentrations of 1 ppm. and 0·5 ppm. resulted in an increased ratio of mitotic cells to interphase cells and in a change in the relative frequencies of division figures, the proportion of prophases being increased and of telophases reduced. It is considered that the probable effect of kinetin is to increase the duration of mitosis and shorten interphase, kinetin acting as a trigger during interphase and thus inducing premature prophase initiation. Kinetin is also thought to affect chromosome spiralization.

93 FAIRMAN, M.
Nuclear morphology of *Bacillus cereus* grown on partially defined media.
J. gen. Microbiol. 1956 : **15** : 257–60.

Lipid inclusions found in nuclei of bacteria after incubation for 24 hr. on a basal medium + urea + glucose, solidified with agar, caused distortions in nuclear shape. Such distortions might be interpreted as mitotic figures.

94 BILQUEZ, A.
Étude du déterminisme de la stérilité observée chez un alloploïde génomique obtenu expérimentalement à partir de deux espèces de *Crepis*: *Crepis multiflora* Sibth. et Sm. et *Crepis zacintha* (L.) Babc. [**Study on the determination of sterility observed in a genomic alloploid obtained experimentally from two species of *Crepis*: *C. multiflora* Sibth. et Sm. and *C. zacintha* (L.) Babc.**].
CR Acad. Sci., Paris 1955 : **241** : 1836–38.

Alloploid plants, all of which were completely sterile, were obtained from the cross *C. multiflora* ♀ x *C. zacintha* ♂; no viable seeds were obtained from the reciprocal. A study of meiosis in the hybrids indicated that sterility was due to a difference between the speeds of development of the chromosomes originating from the two parental species.

95 Sharma, A. K. & Mukherji, R. N.
Induction of chromosomal abnormalities through chemicals in pollen mother cells of *Allium cepa*.
Genet. iber. 1955 : **7** : 57–64.

The chief abnormality induced by treatment with hydroquinone or resorcinol was stickiness, resulting in the formation of groups of chromosomes, laggards, fragments and unequal separation of chromatids. In the case of pyrogallol treatment, the blackening of the tissue rendered observation impossible.

96 Wilson, S. M., Daniel, A. & Wilson, G. B.
Cytological and genetical effects of the defoliant Endothal.
J. Hered. 1956 : **47** : 151–55.

Endothal, the active ingredient of which is 3,6 disodium endoxohydrophthalate, tended to suppress mitosis in root tips of *Pisum sativum* but its effects were not in accordance with those of a typical prophase poison. At each stage of mitosis a high proportion of cells contained one or more chromosomes which failed to move in concert with the majority, as the result, it is postulated, of chromosome damage. Treatment with Endothal by larval feeding or by exposure to the vapour increased the frequency of sex-linked lethals in *Drosophila*.

97 Hrushovetz, S. B.
Cytological studies of ascus development in *Cochliobolus sativus*.
Canad. J. Bot. 1956 : **34** : 641–51.

A detailed study of the sequence of nuclear division in the developing ascus yielded evidence of structural hybridity in all divisions. The haploid chromosome complement, as determined from pachytene and metaphase stages, consisted of seven or eight chromosomes.

98 Gläss, E.
Die Verteilung von Fragmentationen und achromatischen Stellen auf den Chromosomen von *Vicia faba* nach Behandlung mit Schwermetallsalzen. **(The distribution of breaks and achromatic regions on the chromosomes of *V. faba* after treatment with salts of heavy metals).**
Chromosoma 1956 : **8** : 260–84.

The effects of varying concentrations (10^{-2} to 10^{-5} M) of nitrates of Fe, Co, Ni, Cu, Cr, Cd, Mn and Zn upon the number of breakages and achromatic regions in the mitotic chromosomes of root-tip cells of *Vicia faba* were studied. Spontaneous breakages were confined to the SAT zone and the centromeric region in the two SAT chromosomes and to three median regions in the five m chromosomes, but after treatment five further susceptible points were observed in the SAT-chromosomes and three in the m chromosomes.

The ratio of total length of m chromosomes to total length of SAT chromosomes was 5 : 2·0. The numbers of breaks in the two chromosome types were not related to length, the ratio between the number in m chromosomes and the number in SAT chromosomes ranging from 5 : 145·0 with Mn (average of all concentrations) to 5 : 3·8 with Cu; the control, in Knop's nutrient solution, had 5 : 28·7. With the exception of Cu, all the metals induced more breaks in the SAT than in the m chromosomes. The various concentrations, as well as the different metals, differed in their influence upon the distribution of breakages over the whole genome and within each of the two chromosome types. The m chromosomes showed a higher proportion of achromatic regions than the SAT chromosomes, both in the control and in the treated material. The susceptibility of different chromosome regions to the occurrence of achromatic areas varied according to concentration.

There is evidence that the breakages and achromatic regions occur most frequently in the heterochromatic segments of the chromosomes.

99 Kumud Chandra Bora
Biological effects of X- and γ-radiations.
Abstr. Diss. Univ. Camb. 1953–1954 (1955) : 17–18.

Work more fully described elsewhere (cf. *PBA*, XXV, Absts. 1579–80) is reported and, in addition, it is noted that in high-energy radiations in the filtered beam produced by the 30 MeV. synchrotron γ rays of ^{192}Ir of mean energy 0·4 MeV. are less effective than 220 kVp. X rays in inducing breaks in microspores of *Tradescantia*. It is also mentioned that, in studies of the inhibitory effects of treatment with X rays and tetrasodium 2-methyl-1,4-naphthohydroquinone diphosphate upon mitosis in onion root tips, the combined treatments appeared to be more effective than separate treatments.

100 Rutishauser, A. & La Cour, L. F.
Spontaneous chromosome breakage in hybrid endosperms.
Chromosoma 1956 : **8** : 317–40.

By means of a cold treatment of the seed parent

Trillium chromosomes could readily be distinguished in hybrid endosperms from crosses between species of *Trillium* ($2n = 10$) and *Paris quadrifolia* ($2n = 20$). In endosperms of *T. grandiflorum* x *P. quadrifolia* the breakage frequency of *Trillium* chromosomes was little higher than in pure *Trillium* endosperms. In *Paris* x *Trillium* endosperms, *Trillium* chromosomes showed 18·1–35·5% breakage, while *Paris* chromosomes showed little or none; other abnormalities of cell division were also observed. Breakage was distributed unevenly over the five types of *Trillium* chromosome and was concentrated in particular regions of the chromosomes. Since the frequency of breakage in corresponding chromosomes from different *Trillium* parents was higher in the homologues with more heterochromatic segments, it is concluded that spontaneous chromosome breakage is genetically controlled by the heterochromatin. There was no relation between frequency of chromosome breakage and seed inviability since degeneration of endosperm and seed occurred in all crosses.

101 BURNHAM, C. R.
Chromosomal interchanges in plants.
Bot. Rev. 1956 : **22** : 419–552.

This review falls into two main parts. The topics discussed in the first include the general behaviour of chromosomes in which interchanges have taken place, the origin of interchanges, methods of identifying the chromosomes involved, the natural occurrence and experimental production of interchanges, particularly of large chromosome rings, and the value and use of interchanges both in investigating cytological and cytogenetic problems and in breeding. In the second part information on translocations in individual species of 49 dicotyledonous, 47 monocotyledonous, two gymnospermous and three fungal genera is summarized.

102 OGG, J. E.
Studies on a presumptive polyploid strain of the bacterium *Escherichia coli.*
Diss. Abstr. 1956 : **16** : Publ. No. 15,998 : p. 631.

Comparative investigations were carried out on the purine-requiring mutant 82/r and large-celled strain (P6) derived from it by camphor treatment. The greater amount of deoxyribonucleic acid and ribonucleic acid per cell, greater number of chromatin bodies, increased resistance to X, γ and ultraviolet rays and higher frequency of prototrophy resulting from sexual recombination in P6 supported the hypothesis that this strain was polyploid. Data on induced mutation and on segregation of markers were however contrary to this view.

103 ARUN KUMAR SHARMA & MUKHERJI, R. K.
Effect of irradiation on adult nuclei in plants.
Genetica 1956 : **28** : 143–64.

Dry bulbs of *Allium cepa* were X irradiated and then placed in solutions of (1) nucleic acid, (2) levulose and (3) levulose, ammonium sulphate and uracil mixed in equal proportions. The three kinds of solution are known to stimulate division in polyploid nuclei. The effect of (1) and (2) in inducing division in differentiated polyploid nuclei was slight compared with that of (3). It is therefore suggested that irradiation causes a change in base and phosphate synthesis.

104 SHARMA, A. K. & DATTA, A.
Induction of chromosome division by ascorbic acid treatment.
Phyton 1956 : **6** : 71–78.

Treatment of roots of *Allium cepa* with concentrations of ascorbic acid of 0·7 M for 1 hr. or ·000005 M for 4 hr. at 18–20° C. induced division in differentiated polyploid cells and also somatic reduction in diploid cells. Both phenomena are regarded as the result of disturbance in the synthesis of nucleic acid.

105 BURNS, V. W.
X-ray-induced division delay of individual yeast cells.
Rad. Res. 1955 : **3** : p. 217. (Abst.).

Budding cells were resistant to X-ray-induced delay in division. Chromosome number does not apparently play the same role as a factor modifying radiation-induced delay in division as it does in radiation-induced lethality.

106 CONGER, A. D. & JOHNSTON, A. H.
Polyploidy and radiosensitivity.
Nature, Lond. 1956 : **178** : p. 271.

Examination of a flower bud of *Tradescantia paludosa* containing both haploid and diploid microspores showed that diploid cells had twice as many X-ray-induced chromosome aberrations per cell (exchanges or deletions) as the haploid, the frequency of aberrations per chromosome being the same in the $2n$ and n cells.

107 LEUPOLD, U.
Some data on polyploid inheritance in *Schizosaccharomyces pombe.*
CR Lab. Carlsberg 1956 : **26** : 221–51.

In a previous publication (cf. *PBA*, XXI, Abst. 860) it was stated that the various genes controlling homothallism and heterothallism represent a series of alleles at the same locus, since in the crosses h^+ x h^-, h^+ x H^{90}, h^- x H^{90}, h^+ x H^{40} and h^- x H^{40} the parental types segregated in a regular 2 : 2 ratio. However deviations from this rule were observed in two tetrads ($Z27(H^{90})$ x $19b(h^+)$) 20 and ($Z6(H^{40})$ x $19a(h^-)$) 34. Detailed analysis showed that the zygotes from which these tetrads were derived must have been triploid, giving two diploid and two haploid spores. From subcultures of two diploid segregants, and from a cross between a diploid and a haploid clone, tetraploid and triploid segregations were obtained. Diploid segregants homozygous for one of the alleles controlling heterothallic mating type were found to be capable of mating with the opposite strain but incapable of sporulation, while heterozygous diploids (hh^+, Hh^- or h^+h^-) sporulate readily but are unable to mate. These results are discussed in detail with reference to other work on similar topics.

108 Esser, K.
Gen-Mutanten von *Podospora anserina* (Ces.) Rehm mit männlichem Verhalten. [**Gene mutants of *P. anserina* (Ces.) Rehm with male behaviour**].
Naturwissenschaften 1956 : **43** : p. 284.

Three mutant strains isolated at the Botanical Institute of Cologne University and designated q_1, o_1 and r_1 respectively, are described. All are characterized by the absence or incomplete expression of ♀ organs and each is caused by a gene mutation at a different locus.

109 Maccacaro, G. A. & Comolli, R.
Surface properties correlated with sex compatibility in *Escherichia coli*.
J. gen. Microbiol. 1956 : **15**: 121–32.

F^- strains possess a lower acid agglutination point, a stronger affinity for a basic dye and a greater stability in broth cultures than F^+ strains of corresponding phenotype (cf. *PBA*, XXVI, Abst. 91). Compatibility and these surface properties are simultaneously transmitted "infectively" from F^+ to F^- strains.

110 Stern, K.
Über die Erblichkeit des Wachstums (vorläufige Ergebnisse eines Versuches mit Mutanten von *Antirrhinum majus* L.). [**On the inheritance of growth (preliminary results of an experiment with mutants of *A. majus* L.)**].
Züchter 1956 : **26** : 121–27.

The mode of inheritance of growth rate and growth, as measured by plant height, was studied in crosses involving strain 50 of *A. majus*, from Voldagsen, and 13 mutants of this strain, each of which differed from the parental form in respect of a single allele. It was shown that growth was determined by a series of polygenes acting uniformly throughout the life cycle of the plant and that the action of genes acting on growth merely at a particular stage in the development of the plant was insignificant. A model is provided to illustrate mathematically the action of the different alleles throughout the life cycles of the various hybrids; superdominance was observed in a number of cases. The possible bearing of these findings on forest-tree breeding is indicated briefly.

TAXONOMY

111 Harberk, D. J.
Correlated characters in population studies.
New Phytol. 1956 : **55** : 154–63.

Since the scatter diagram of two correlated characters, x, y, approximates to an ellipse, it is possible to transform these into two uncorrelated characters, $x + \tan \theta y$, $\tan \theta x - y$, by taking the axes of the ellipse as new coordinates, θ representing the angle through which the scatter has been turned from the position of zero correlation. The applications of this transformation to biometrical taxonomy are discussed.

ECONOMIC LOWER PLANTS

112 Seeger, J.
Essais de différenciation de souches de *Rhizobium* au moyen d'indicateurs d'oxydoréduction. (**Attempts at distinguishing strains of *Rhizobium* by means of oxidoreduction indicators**).
CR Soc. Biol., Paris 1955 : **149** : 2021–23.

The method described was devised at the Microbiology and Biochemistry Laboratory of the Gembloux Agronomic Institute, Belgium, and facilitates the selection of strains of *R. trifolium* with improved ability to fix nitrogen and capable of competing with other strains.

113 Shimwell, J. L.
Transmutation of species in the genus *Acetobacter*.
J. Inst. Brew. 1956 : **62** : 339–43.

By the use of two highly selective laboratory techniques favouring the survival of cellulosic and noncellulosic mutants respectively, variants indistinguishable from *A. xylinum*, *A. xylinoides*, *A. orleanense* and *A. rancens* were obtained from pure cultures of *A. mesoxydans*, the borderline of species differentiation thus being crossed not only in respect of cellulose production but also between the *mesoxydans* and *oxydans* groups. The significance of these findings for an understanding of the evolution of species within the genus *Acetobacter* and problems of nomenclature involved are discussed briefly.

114 Van Dyck, P., De Somer, P., Vanderhaeghe, H. & Parmentier, G.
Mycologische gegevens over een streptogramine-gelijkend bestanddeel. (**Mycological data on a substance resembling streptogramin**).
Agricultura, Louvain 1956 : **4** : 195–220.

A strain of *Streptomyces virginiae* isolated at the Bacteriological Laboratory of Louvain University, Belgium, and producing an antibiotic similar in many respects to streptogramin is described and its biochemical properties are listed. Exposure to ultraviolet rays and mustard gas gave rise to mutants differing from the parent strain in size and colour and in the amount of antibiotic substance secreted. High-yielding strains have been selected from among these mutants.

115 Békésy, N.
Über die vegetative und generative Übertragung von Mutterkorneigenschaften. (**On the vegetative and generative transfer of ergot characters**).
Z. Pflanzenz. 1956 : **35** : 461–96.

The results of genetical studies on the inheritance of growth vigour, size and shape of the sclerotia, colour of the fruiting bodies, virulence on different host plants, firmness of the attachment of the sclerotia to the ear of the host plant and alkaloid content of the sclerotia are presented. Strains of *Claviceps purpurea* with greatly improved yields of alkaloids have been obtained at the Institute for Research on Medicinal Plants, Budapest, Hungary, by the selection of naturally occurring mutants with a high alkaloid content. A number of albino mutants were also observed, but these had low alkaloid contents.

116 Maisin, J., Lambert, G. & van Duyse, E.
Sélection, adaptation, mutation et radiorésistance acquise aux rayons X chez *Saccharomyces cerevisiae.* (**Selection, adaptation, mutation and acquired resistance to X rays in *S. cerevisiae***).
CR Soc. Biol., Paris 1955 : **149** : 2276–80.

Strains of *S. cerevisiae* resistant to the lethal effects of concentrated X irradiation were obtained at the Cancer Institute, Louvain University, Belgium, by repeated irradiation with increasing doses of X rays. The resistant strains, which may have arisen either as the result of mutation or by selection, were not distinguishable morphologically from the susceptible parent strain.

117 Giménez Martín, G.
Carlsberg Laboratorium. Técnicas y trabajos en el Departmento de Fisiología. (**The Carlsberg Laboratory. Techniques and work of the Physiology Department**).
Genet. iber. 1955 : **7** : 65–84.

The techniques used in studying yeast genetics at the above institute are described for the benefit of Spanish readers.

118 Hawthorne, D. C.
The genetics of galactose fermentation in *Saccharomyces* hybrids.
CR Lab. Carlsberg 1956 : **26** : 149–60.

It is shown that three complementary genes are involved in galactose fermentation, and that the dominant alleles of all three genes, g^{-1}, g^{-2} and g^{-3}, must be present for rapid fermentation to take place. The gene g^{-1} shows close centromere linkage, g^{-2} shows no centromere linkage, while g^{-3} shows both close centromere linkage and close linkage to a gene for tryptophane dependence, and is also allelic with g^{-5}, a gene causing slow fermentation of galactose by *S. chevalieri.* (Cf. *PBA*, XVIII, Abst. 2136).

119 Lindegren, C. C., Lindegren, G., Drysdale, R. B., Hughes, J. P. & Brenes-Pomales, A.
Genetical analysis of the clones from a single tetrad of *Saccharomyces* showing non-Mendelian segregation.
Genetica 1956 : **28** : 1–24.

A single tetrad segregated irregularly for the adenine-independent (*AD*) white condition and adenine-dependent (*ad*) pink condition, 3 recessives and 1 dominant being obtained. The tetrad segregated normally with respect to other markers. Each culture derived from the tetrad segregated in a normal manner for *AD*/*ad*, white/pink colour and other markers, when outcrossed to haploid clones. The tetrad therefore gave rise to haploids. Gene conversion is regarded as being responsible for the occurrence of the extra recessive (cf. *PBA*, XXIII, Abst. 2429). The converted clone was identified by its physiological activity, its response to a medium lacking adenine being intermediate between that of the white adenine-independent culture and the two other pink cultures derived from the same tetrad.

120 OGUR, M. & ST. JOHN, R. C.
Demonstration by cellular nitrogen and turbidity of the haploid state of the four clones of yeast derived from an irregularly segregating locus.
Genetica 1956 : **28** : 25–26.

The clones 16327–30 derived from the irregularly segregating tetrad described in a previous paper (cf. Abst. 119) resembled known haploid cultures with respect to the above two size-related properties.

121 PITTMAN, D. D. & PEDIGO, P. R.
Demonstration by X-ray inactivation of the haploid state of the four clones of yeast derived from an irregularly segregating ascus.
Genetica 1956 : **28** : 27–30.

Investigations on clones 16327–30 (cf. Absts. 119–20) indicated the following: (1) the X-ray survival curves of all four clones on a complete or minimal medium were exponential and thus typical of haploids; (2) the converted clone 16328 was significantly more resistant to killing by X rays than the other three clones; and (3) reverse mutation to adenine independence could be induced in the adenine-dependent (*ad*) pink cultures 16328, 16329 and 16330 by ultraviolet irradiation.

122 WICKERHAM, L. J. & BURTON, K. A.
Hybridization studies involving *Saccharomyces lactis* and *Zygosaccharomyces ashbyi*.
J. Bact. 1956 : **71** : 290–95.

Hybrids of *S. lactis*, a heterothallic haploid species with round ascospores, with *Z. ashbyi*, which is homothallic and predominantly diploid and has crescent-shaped ascospores, were produced by growing compatible strains of the two species together through four or more serial transfers. The hybrids were pink or red and could thus be distinguished from the white parental forms. Some of the hybrids were homothallic, some were heterothallic and others were nearly sterile. The hybrids combined the ability of the first parent to assimilate α-glucosides with that of the second parent to assimilate inulin, and, like both parents, were able to assimilate lactose. A few hybrids were unstable and produced variants with differing degrees of pigmentation and α-glucosidase.

123 WICKERHAM, L. J. & BURTON, K. A.
Hybridization studies involving *Saccharomyces fragilis* and *Zygosaccharomyces dobzhanskii*.
J. Bact. 1956 : **71** : 296–302.

S. fragilis, a species able to assimilate and ferment lactose but not maltose or other α-glucosides, was hybridized with *Z. dobzhanskii*, which has the reverse properties. The hybrids were able to ferment both types of carbohydrate. The ascospores are reniform to spheroidal in *S. fragilis*, crescent-shaped in *Z. dobzhanskii* and irregular, tending towards spheroidal, in the hybrids. It is thought that *S. fragilis* is a natural hybrid of *S. lactis* x *Z. ashbyi* (cf. Abst. 122). There was some variation in the ability of the hybrids and their ascosporic cultures to ferment α-glucosides, some variants being able to ferment all the α-glucosides tested and others only maltose.

124 RAEVSKAJA, O. G.
(The effect of inbreeding and hybridization upon vitality of some yeasts of the genus *Saccharomyces*).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1955 : No. 22 : 218–43. [Russian].

Hybrids of *Saccharomyces cerevisiae* x *S. cerevisiae*, *S. ellipsoideus* x *S. ellipsoideus* and *S. cerevisiae* x *S. ellipsoideus* were distinguished by improved vitality, were more active and multiplied more rapidly than the parent strains. Inbreeding for one generation produced effects of a contrary kind.

125 GILLILAND, R. B.
Maltotriose fermentation in the species differentiation of *Saccharomyces*.
CR Lab. Carlsberg 1956 : 139–48.

One hundred and ten strains of yeast including at least one strain of each species were tested in respect of their ability to ferment maltotriose, and strains of eleven species were found to be able to carry out this fermentation. A hybrid was produced between *S. carlsbergensis* (fermenting) and *S. cerevisiae* var. *ellipsoideus* (nonfermenting) in which the inheritance of maltotriose fermentation was found to be governed by a single gene. It is suggested that this fermentation might be of value for the characterization of yeast species.

126 LINNANE, A. W. & STILL, J. L.
A re-examination of some problems of 'petite' yeast.
Aust. J. Sci. 1956 : **18** : 165–66.

According to investigations at the Department of Biochemistry, University of Sydney, granules sedimentable at 25,000 g. in the petite mutant 59RA studied by Ephrussi and his colleagues are enzymically similar to those of normal yeast, except for the absence of cytochrome b and cytochrome c oxidase. It is therefore suggested that the cytoplasmic genetic units whose inactivation is believed to be responsible for the appearance of the petite type are not identical with the mitochondria (cf. *PBA*, XXVI, Abst. 832).

127 Skovsted, A.
Some unstable mutations in yeast.
CR Lab. Carlsberg 1956 : **26** : 335–47.

Three types of vegetative mutations in giant colonies are described: (1) from a normal colony to one with submerged growth and back, (2) from a white colony with a red cap to an orange-red colony and (3) from a three-coloured colony, red, pink and white, to many different combinations. Single cells isolated from one colony showed different mutability. The observed phenomena are discussed in relation to other examples, and it is suggested that they are due to unstable cytoplasmic factors. The cells in the red-capped white colony were found to be differentiated, with correlation between morphological and genetic characters such that isolated red cells may give rise to pure white, pure red or red-capped white colonies, while isolated white cells only give pure white or red-capped white colonies.

128 Yčas, M.
A hereditary cytochrome deficiency appearing in yeast grown at an elevated temperature.
Exp. Cell Res. 1956 : **10** : p. 746.

When a normal strain of *Saccharomyces cerevisiae* was grown aerobically at 40° C. and the resultant cells were plated out at 30° C., over 95% of the colonies were of the petite type. The petite property persisted through subsequent transfers at 30° C. Further investigations on this phenomenon by B. Ephrussi indicate that high temperature has a direct mutagenic effect.

129 Pittman, D. D. & Pedigo, P. R.
Ultraviolet-induced mutation at the adenine locus in aerobic-sufficient cells and in aerobic-deficient cells of Saccharomyces.
Rad. Res. 1955 : **3** : p. 340. (Abst.).

Normal and petite cells showed no significant difference in the rate of ultraviolet-induced change from the *AD*/*ad* condition to homozygosity for *ad*.

130 Bočarov, S. N.
(Variability of yeasts cultured for a long period on a sucrose substrate).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1955 : No. 22 : 208–17. [Russian].

Saccharomyces strains cultured upon sucrose for a period of 10 years showed reduced vitality and acquired new morphological characteristics, which in some of the strains remained constant.

131 Lindegren, C. C. & Lindegren, G.
Eight genes controlling the presence or absence of carbohydrate fermentation in Saccharomyces.
J. gen. Microbiol. 1956 : **15** : 19–28.

A survey is given of the enzymes and corresponding fermentative abilities associated with the following genes which have been identified by the authors and their colleagues in previously published and unpublished work on the Carbondale stock of yeast: *GA* controlling galactose fermentation by an enzyme system whose identity has not yet been established; the multiple alleles at locus *MZ* governing the production of melezitase; *MA* for maltase production; *DX* controlling the synthesis of a dextrinase capable of splitting dextrin and glycogen; *ST* determining the production of an amylase which splits single hexoses from starch and amylopectin; *SU* for the formation of β-d-fructofuranosidase; *ME* for melibiose synthesis; and *MG* for the production of methyl-α-d-glucopyranosidase.

132 Nelson, N. M.
Studies on dosage of the G_1 gene and enzymatic activity in Saccharomyces.
Diss. Abstr. 1956 : **16** : Publ. No. 15,712 : p. 434.

Investigations on 4*n* clones with one, two, three or four doses of G_1 revealed a dosage effect for galactocinase, hexocinase and phosphogalactowaldenase activity but not for phosphoglucomutase or maltase activity.

133 Hjort, A.
Notes on *Saccharomyces rouxii* Boutroux and other yeasts with special regard to their life cycles.
CR Lab. Carlsberg 1956 : **26** : 161–81.

Observations on the life histories of a number of yeasts are discussed, with special reference to naturally occurring and induced changes of phase from haploid to diploid. The significance of the relationship between the two phases from the point of view of identification and classification is emphasized, together with the importance of stating whether a description refers to haploid or diploid cells. The species discussed in detail include *S. rouxii* var. *polymorphus*, *S. marxianus*, *S. paradoxus*, *Schwanniomyces occidentalis*, *Zygosaccharomyces fermentati* and *Z. vini*.

CROP PLANTS

Carnegie Institution of Washington. Year Book No. 54 : 1954–1955 : Pp. 311.

134 *Clausen, J., Hiesey, W. M. & Nobs, M. A.* Poa *investigations.* (*pp. 172–75*).
Seed of apomictic hybrid lines and of their parental species is being sown at a large number of localities throughout the USA, so that their responses to widely differing cultural and environmental factors may be investigated. Work is in progress in cooperation with Purdue University to develop strains suitable for the Middle West region, by means of interspecific hybridization of predominantly apomictic species. Two lines of *P. pratensis*, from Oregon and California, have grown vigorously at Purdue, and have also proved tolerant of extreme conditions elsewhere, although most of the apomictic lines show only a limited range of tolerance. The tolerant apomicts, of which line 4694–8 of *P. scabrella* x *P. pratensis* is given as an example, fluctuate only slightly with different environmental conditions, whereas the more specialized strains become highly modified. Many of the commercial varieties showing a wide range of tolerance were found to be a mixture of several strains, whose individual tolerance represented only a part of the total.

135 *Cox, L. M. & Clausen, J. Chromosome numbers of hybrid* Poa *lines.* (*pp. 175–77*).
The study of chromosome numbers of hybrid lines in relation to their parents continued (cf. *PBA*, XXVI, Abst. 240), and a table is provided which includes the numbers of most of the lines at present undergoing regional trials. Some items of special interest are mentioned in detail. An F_1 *P. ampla* x *P. pratensis* hybrid with $2n = 70$ has produced three F_2 apomictic lines with 98–100 chromosomes but with little change in external morphology, all three lines closely resembling *P. pratensis*. In contrast, F_2 lines from an F_1 with the same parents as above but with $2n = 92–100$ have similar chromosome numbers to their F_1 parents, but closely resemble *P. ampla*. Some F_2 lines show little change in chromosome number from their F_1 parents, e.g. *P. scabrella* x *P. pratensis* where in the F_1 $2n = 70$ and in the F_2 $2n = 69$ and *P. scabrella* x *P. pratensis* x *P. ampla* where $2n = 63$ and 62 in the F_1 and F_2 respectively, but in both these cases the two generations are morphologically very distinct. In other cases the chromosome number may vary considerably, e.g. two lines from *P. ampla* x *P. pratensis*, where $2n = 68$ and 80, but the lines are indistinguishable morphologically. Fifteen apomictic lines have been developed from a *P. ampla* x *P. pratensis* F_1 with $2n = ca.$ 83 of which three have $2n = 93–109$, five $2n = 68–75$, and seven $2n = ca.$ 83; all these lines differ widely in their appearance and in their responses to environmental factors, and are being grown together in two localities for comparison.

136 *Hershey, A. D., Burgi, E., Garen, A. & Melechen, N. Growth and inheritance in bacteriophage.* (*pp. 216–19*).
Investigations to ascertain whether the proteins of T2 have any genetic function are reported. It has been shown that protein synthesis is specifically inhibited in both infected and uninfected bacteria by chloramphenicol, but that nucleic acid synthesis is not directly affected. If chloramphenicol is added to a bacterial culture at the time of infection both protein and nucleic acid synthesis are suppressed to a similar extent, but if the inhibitor is added 10 minutes after infection nucleic acid synthesis shows very little suppression. From this it is concluded that nucleic acid synthesis is independent of concurrent protein synthesis but is dependent on prior protein synthesis. It has been shown that nucleic acid formed in this way, in the presence of chloramphenicol, is genuine virus precursor, and is not formed inside the membranes within which the finished virus particles are enclosed. The nucleic acids of T2 and of a temperate *Salmonella* phage show similar degrees of inactivation caused by decay of preassimilated P^{32} and exposure to X rays, but when subjected to ultraviolet light the nucleic acid of the *Salmonella* phage is much more resistant. When measured in terms of the ability of irradiated viruses to grow in irradiated bacteria the sensitivity to ultraviolet light is about equal. These facts are interpreted as showing that in the *Salmonella* phage ultraviolet-damaged nucleic acid can be replaced by undamaged homologous material from the host, but for a reason as yet unknown this substitution cannot take place after P^{32} decay or X-ray damage. The nucleic acid of T2 however is qualitatively different from that of the host, and substitution is not possible.

137 *Demerec, M.* et al. *Bacterial genetics—I.* (*pp. 219–34*).
Progress has been made in the analysis of the genetic constitution of strains of *Salmonella typhimurium* deficient in power to synthesize tryptophane, histidine, methionine, cystine, leucine, isoleucine, valine, purine and serine, using the transduction technique described in a previous report (cf. *PBA*, XXVI, Abst. 243).

The length of the chromosome region that can be studied in any one experiment is determined by the length of the fragment carried by the infecting phage, the largest so far observed being in the *try–cys–me* region and containing up to twelve identified gene loci. It has been found that loci associated with related metabolic functions are liable to be close together on the chromosome. In two cases in which genetical and biochemical analyses have been completed, of which a detailed account is provided, the order of genes on the linkage map follows the sequence of the biosynthetic reactions which they control. This arrangement is also suggested by work with other mutants not yet completed, but it appears to be not obligatory, since the *cysB* and *cysC* loci, although linked, are separated by a block of *me* loci.

An investigation has been begun with strain LT_2 of *S. typhimurium* to find out whether transformation, i.e. the transference of genetic characters by DNA, can be induced in this strain, and to use this method to supplement the information obtained by transduction experiments. Transformation using disintegrated bacteria, or DNA extracted from them, has been brought about, and with DNA the frequency is at least as high as the frequency of transduction of the same genetic markers under optimum conditions. Donor material from disintegrated bacteria loses its potency after treatment with deoxyribonuclease, suggesting that DNA is responsible for its effectiveness. The results of the work so far indicate that, during the process of extracting the DNA-containing material from donor bacteria, changes were induced in the genetic material and were subsequently transmitted to the offspring of the recipient bacteria.

Further investigations have been made, using *Escherichia coli*, of the connexion between the hourly rate of mutation from T5 sensitivity to T5 resistance, and the growth rate of the bacterium.

138 *Witkin, E. M. & Thomas, C. T. Bacterial genetics—II.* (*pp. 234–45*).

Transduction experiments on *Salmonella typhimurium* have been carried out using temperate phage with sensitive bacteria, and virulent phage with lysogenic bacteria. In the first case a lag of one or two divisions occurs before the appearance of the transduced prototroph, but in the second case the delay is much longer.

Continuing the investigations reported in *PBA*, XXVI, Abst. 244, it has now been established that the yield of induced mutations induced by ultraviolet irradiation is determined by the aminoacids present in the agar during the first part of the postirradiation lag period. The delayed appearance of these mutations is not due to a period of genetic instability caused by irradiation, as was at first thought, since in the presence of aminoacids the maximum yield of induced mutations is obtained provided the residual divisions average at least one. With the strain try–3, when tryptophane alone is provided as the source of enrichment, no induced mutants are obtained, although this is the specific growth factor required by try–3, and any single aminoacid is only partially effective. Cells which have been grown without aminoacids before irradiation appear to become adapted to producing their own, since they produce about half the potential yield of induced mutants when grown without aminoacids after irradiation. It has been found that the synthesis of DNA in irradiated try–3 increases logarithmically from the moment of irradiation, and the time required for doubling the initial level of DNA is approximately one third of the lag phase, and corresponds to the period of sensitivity to aminoacid concentration. In the light of this it is suggested that the critical period corresponds to the period of chromosome duplication, and that the frequency of induced mutations is determined by the conditions prevailing during this phase of cell division.

A technique has been developed by means of which the early growth rates of individual clones can be followed, as opposed to the average growth rate of the whole population. Using this technique it has been shown that clones of induced mutant cells increase almost as rapidly as nonmutant clones.

139 *McClintock, B. Controlled mutation in maize.* (*pp. 245–55*).

Further investigations of the *Spm* unit described in a previous report (cf. *PBA*, XXVI, Abst. 246) have shown that it may occupy any of several positions, two on each of the chromosomes V, VI and IX, and other sites not yet identified. When located on the *Y*-carrying chromosome VI it is approximately 35 crossover units from *Y*. The mode of control of gene action and mutation exerted by the a_1^{m-1}–*Spm* system has been further elucidated. The element inserted at the A_1 locus controls both gene action and changes in gene action in the absence of *Spm*. In the presence of *Spm*, gene action at A_1 is totally suppressed, but modifications of the elements at A_1 occur, effecting either changes in the controlling element at A_1 or stable mutations giving rise to a series of alleles differing from each other qualitatively and quantitatively. *Spm* may be transposed from one locus to another within the nucleus without losing its specificity of action, and loss of *Spm* from some nuclei and increase in others may occur within an individual plant. No changed pattern of mutation at a_1^{m-1} is caused by an increased number of *Spm* elements in the nucleus. In contrast, in the case of the a_1–*Dt* system, increase in the number of *Dt* elements causes increased frequency of mutation at the a_1 locus.

Investigations of the elements *Ds* and *Ac* have shown that they may function as a two-element system in which the *Ds* element directly controls the change in gene action at the locus where it is situated, while the *Ac* element governs the occurrence of mutation-inducing changes at *Ds*. Changes from a one-element system to a two-element system in the case of *Ds* and *Ac* have been observed.

When *Ds* is inserted to the left of Sh_1 on chromosome IX it will induce changes in chromosome segments on either side of itself which may be six or more cross-over units long. In cases where the genetic components furthest from *Ds* exhibited reversion it was found that these reversions were brought about by some change involving the *Ds* element itself, that *Ac* was required for their occurrence, and that the time of occurrence depended on the dosage of *Ac* present in the nucleus. With *Ds* at this locus reversions are not accompanied by loss of *Ds* or change in its location, although this is the case when *Ds* is inserted at some other loci.

140 *Kaufmann, B. P.* et al. *Organization of cellular materials.* (*pp. 255–63*).

Solutions of ribonuclease in which onion roots were growing acquired the capacity to degrade DNA in fixed sections, whereas ribonuclease not used in the treatment of growing roots only showed this effect very slightly. The authors suggest that the chromosomes contain an RNA–DNA complex, and that the DNA of this complex cannot be degraded until the RNA is first removed. They also incline to the view that RNA and deoxyribonuclease form a cytoplasmic complex, the RNA possibly controlling the activity of the enzyme component.

A study has also been made of the effect of cytochrome c and other basic proteins in causing a reduction of ultraviolet absorption in the nucleic acid region of the spectrum.

141 **Crop improvement in other lands.**
NZ Wheat Rev. 1953, 1954, 1955 (1956): 43–45.

The organization of breeding and research in the Netherlands, Western Germany, Sweden and Denmark, where much work is carried out by private breeders, is briefly compared with the situation in Canada, where practically all breeding work is done at official experimental stations or at the universities.

An editorial note describing the system in use in New Zealand is appended.

142 HADFIELD, W. V.
Plant improvement in Europe.
NZ Wheat Rev. 1953, 1954, 1955 (1956): 40–43.

The organization of plant breeding, varietal testing and seed certification in various European countries is surveyed, the degree of cooperation between official institutes and private breeders being indicated and different systems for granting breeders' rights noted.

Third Annual Report of the Scottish Horticultural Research Institute, 1955–1956 : Pp. 40.

143 *Wood, C. A. Pomology.* (*pp. 10–13*).
Raspberry. Intervarietal and interspecific hybridization continued.

144 *North, C. Vegetable culture.* (*pp. 14–16*).
Brassica. Plants from F_1, F_2 and back-cross lines from crosses between the cabbage January King on the one hand and Amager and Savoy types on the other have been selected on the basis of external appearance and structure of the heads. The crosses were originally effected with the aim of combining the hardiness of the first variety with the reliable heading characteristics of the others.

With the aim of obtaining hardy, early-maturing Brussels sprouts strains, resistant to being blown over by the wind and producing dark green sprouts, plants of Ashwell's strain were crossed with Cambridge Special, Amager and Castricum Glory; selections have been made in the F_1.

Phaseolus. Crosses were made between *Ph. multiflorus* 'Princeps' ♂ and *Ph. vulgaris* 'Record' ♀ with the object of combining the ability of the former to grow under cool weather conditions with the dwarf habit and high quality of the latter. The F_1 plants were largely sterile but some seed was obtained by back crossing to *Ph. vulgaris*.

145 *Swarbrick, T. Genetics.* (*pp. 19–21*).
Strawberry. With the aim of studying the relationship between June yellows and the

tendency to produce yellow seedlings, reciprocal crosses and selfings have been effected in varieties of the following classes: (1) varieties affected by June yellows; (2) varieties in which June yellows has not been observed but which give yellow or variegated seedlings in their progeny; (3) varieties in which neither June yellows nor yellow seedlings have been observed; and (4) varieties on which information is required.

146 *Reid, R. D. West of Scotland Unit (Auchincruive). (pp. 28–34).*

Strawberry. Strains of *Fragaria virginiana* have shown promise as sources of resistance to red core, but it has proved difficult to break the close linkage between resistance and small fruits. Some success has been attained, however, by repeated back crossing to large-fruited hybrids. Increasing attention is being given to the study and development of field resistant material in which the roots are penetrated by the fungus to only a small degree. Only four of the eight varieties used for differentiating races of red core are now regarded as necessary, viz. Perle de Prague, Climax, Auchincruive 11 and Aberdeen. Four physiological races have been distinguished by means of these indicators, but individual isolates within races differ in the amount of infection they cause in some varieties. Seven seedlings of *F. virginiana* have proved immune from all races tested.

In studies of the relationship between the incidence of June yellows and the occurrence of variegated seedlings in the progeny, it was found that higher numbers of variegated seedlings occurred in the progenies of selfed material than in hybrid progenies. A very high proportion of variegated seedlings occurred in the progenies of selfings or crosses between severely affected parents.

Raspberry. A selection from seedlings raised in 1946 is thornless and possesses excellent flavour and fruit quality.

147 *North, C. & Frith, L. H. Variety trials of vegetables in Scotland. I. Summer spinach at Invergowrie 1953–1955. (pp. 37–40).*

In trials of ten varieties sown in the field in March or April, those varieties which bolted latest yielded most, the highest yields being given by King of Denmark and the Swedish variety Verina.

Annual report of the Scottish Plant Breeding Station, 1956 : Pp. 109.

148 *Gregor, J. W. Director's report. (pp. 5–20).*

Oats. Three-year trials have been carried out of seven varieties, at three centres, and the grain and sheaf yields are expressed as percentages of the yield of Aa 733. This variety, named Albyn Bard, outyielded the others at the Argyll centre, and has been released as suitable for areas of high rainfall and low fertility in the west of Scotland. Aa 720, named Albyn Empress, is recommended for heavy land where an early ripening oat is required.

Herbage plants. Polycross trials have been laid down of seven early ryegrass strains and ten late cocksfoot strains.

Potato. Breeding for disease resistance by means of interspecific hybridization has continued. *Solanum rybinii* shows marked resistance to virus Y, especially clone CPC979. In rare cases, when infection has been found following graft inoculation, the tuber progeny of infected plants have remained virus free, suggesting that the resistance operates systemically to prevent virus multiplication. When *S. rybinii* is hybridized with *S. simplicifolium* and *S. demissum*, which possess genes responsible for systemic necrosis when infected with virus Y, the lethal necrotic response in the offspring is reduced to local-lesion formation at the site of infection. These hybrids and fully resistant plants have been used in attempts to transfer resistance to commercially acceptable varieties. Since the resistant parental material is diploid, some dissipation of resistance occurs, but this has been overcome by the use of colchicine-induced tetraploids of *S. rybinii* hybrids.

Inheritance studies of *S. stoloniferum* have shown that the necrotic response to virus Y of resistant clones is controlled by a single gene and is dominant to susceptibility. A special breeding programme to utilize this gene has now reached the third generation with no alteration in resistance.

S. acaule contains clones which are immune, hypersensitive or susceptible to virus X. This response is controlled by a single locus, with immunity dominant to both other responses and susceptibility recessive to both. The American seedling US41956 is also X immune, but in this case immunity is controlled by two complementary genes, which are both required for the manifestation of immunity. These two independent sources of immunity are both being utilized.

Resistance to *Phytophthora infestans*, controlled by four major genes, is found in *S. demissum* but even plants possessing all four genes are not resistant to all strains of the fungus. Minor genes providing a high degree of field resistance were found in hybrid derivatives of *S. demissum*, *S. salamanii* and *S. stoloniferum*, which appear unaffected by parasitic specialization. This type of resistance is polygenic and is being concentrated by intercrossing selected resistant types.

Four clones of *S. andigenum* were found to be resistant to the root eelworm, *Heterodera rostochiensis*. The larvae of the parasite are stimulated to hatch but are unable to reproduce in the roots. Resistant clones have been produced by hybridization and back crossing with commercial varieties. All of these are immune from *Synchytrium endobioticum*, many are field immune from virus X, and some are resistant to virus Y. Blight resistance has been incorporated in some progenies.

A new variety, named Pentland Beauty, has been bred from Craigs Royal x 1306a(2). It is early maturing, crops well and is of good cooking quality. It possesses field immunity from viruses X, A and B, the foliage is field immune from the common strains of blight though the tubers are susceptible, and it is moderately resistant to dry rot. Cracks appear on the mature tubers if they are roughly handled.

Sugar beet. Work has continued, in cooperation with the Plant Breeding Institute, Cambridge, on the problem of obtaining a strain which will withstand the tendency to bolt when sown early.

Kale. A trial of 6 inbred plants of the F_2 generation of M41, and 7 outcrossed F_2 plants of various combinations of M38, 39, 40 and 41, was laid down in which weight of stems and leaves and leaf : stem ratio were compared with the figures for 2 marrow-stem kale controls. The outcrossed plants, though variable, were all leafy and in some cases heavy yielding, the inbreds were uniform and leafy but lacking in vigour, while the controls were heavy-stemmed and had a leaf : stem ratio of only 0·9 : 1.

149 *Cockerham, G. & Macarthur, A. W. A note on clonal variation in the potato variety Majestic. (pp. 23–26).*

From yield data provided by trials at different localities during the years 1952–55, it appears that clone 46/53 showed consistently lower, and clone 46/78 consistently higher productivity, than the other clones tried, although the yields varied greatly between centres and between years. The possibility of clonal variation affecting field resistance to X, Y and leaf-roll viruses was also investigated, but only in respect of virus Y was any significant difference found.

150 *Macarthur, A. W. Potato virus S. (pp. 27–36).*

Lists are given of British and American varieties which have been found free from, or infected with, virus S, and of clones of wild potato species which have been infected with the virus. It is suggested that virus S is serologically related to paracrinkle virus, since it was not found possible to separate two distinct viruses from King Edward potatoes.

151 *Hawkes, J. G. A revision of the tuber-bearing solanums. (pp. 37–101).*

This article forms a summary of the author's revised classification of potato species, in the form of outline descriptions of all the tuber-bearing species, with dichotomous keys for their identification. The species are arranged, in 17 series, in ascending order of chromosome number, and a separate key is provided for the cultivated species.

Sixth Annual Report of the National Vegetable Research Station, Wellesbourne, Warwick, for 1955 (1956) : Pp. 72.

152 *Haigh, J. C. Plant breeding report. (pp. 11–16).*

Beetroot. The monogerm condition and resistance to bolting are being introduced into Detroit from beetroot material from the USA. Male sterility is also being transferred to beetroot, using sugar beet from the USA.

Radish. Varieties of forcing radish have been classified into 10 groups.

Onion. Functional male sterility in Cambridge 10, due to nondehiscence of the anthers, has proved to be only partial under some environmental conditions (cf. *PBA*, XXV, Abst. 3453). Male sterility which appears to be cytoplasmically controlled has been found in Cambridge 2 and 10 and a breeding line.

Blow flies have again been used as pollinators with marked success.

Asparagus. The development of seed giving an entirely ♂ population is in progress, according to Sneep's method (cf. *PBA*, XXIV, Abst. 694).

Spring cabbage. Plants were selected from varieties giving the best performance as hearted cabbage or greens and from disease-resistant varieties, for use as parents in an attempt to breed an improved dual-purpose spring cabbage.

Brussels sprouts. The S_1 and S_2 of Cambridge Special have shown little difference in size, both having about 75% of the leaf area of the parent stock. Evidence has been obtained from these selfed lines that tendency to bolt is both environmentally and genetically controlled.

Of 39 selfed plants of Cambridge 3, 8 were effectively self incompatible. The remaining plants each produced 5 or more seeds per 100 flowers, the highest yield being 1200 seeds per 100 flowers. Inbreds from the 39 plants differed considerably in economic characters and showed little inbreeding depression; in some cases the progenies produced from the same parent by selfing and mass pollination differed widely.

Lettuce. F_2 hybrids from crosses involving Lincoln Giant Greatheart, 45634M, *Lactuca altaica* and other varieties as mosaic-resistant parents were selected for freedom from mosaic under field conditions and selfed for further testing. Cheshunt Early Giant does not transmit mosaic by the seed and is being used in crosses in an attempt to transfer this character to other varieties. Types and synonymous varieties were established among the large number of frame and winter lettuces studied.

153 *Johnson, A. G. Spring cabbage varieties. Their classification and performance. (pp. 17–34).*

Of the 100 British and foreign varieties studied, 86 were classified into 17 groups according to maturity period, heart shape and other morphological features. The remainder were unsuited to the environmental conditions at Wellesbourne and failed to produce classifiable mature plants. Information is given on the yield, disease injury, bolting, colour and quality of the classified varieties in trials as hearted cabbage and spring greens.

154 *Nelder, J. A. Statistics report. (pp. 61–62).*

Activities included a continuation of a study of polygenic variation in flowering time and seed size in French-bean varieties.

Report of the Rothamsted Experimental Station, Harpenden, 1955 : (1956) : Pp. 255.

155 *Watson, D. J. Botany department. (pp. 70–79).*

Investigations are in progress to determine, by means of growth analysis, the physiological basis of the intervarietal differences in grain yield of the barleys Plumage-Archer, Proctor and Herta.

156 *Bawden, F. C. Plant Pathology department. (pp. 89–106).*

Of 272 sugar-beet progenies obtained by selfing plants that produced large roots although infected with yellows, a few yielded more than commercial varieties both when infected and when uninfected and a number yielded more only when infected.

In studies of *Fusarium oxysporum* f. *pisi*, two weakly pathogenic mutant strains induced by ultraviolet irradiation of a virulent wild-type culture combined to form heterocaryons which were as virulent as the original wild type. In cultures derived from single spores formed by heterocaryons between the physiological races 1 and 2, 3 out of 10^8 combined properties from both races. Two of these new combinations were able to infect a pea variety not attacked by races 1 and 2 and susceptible only to race 3. Investigations into the nature of resistance showed that root exudates from resistant peas inhibited the growth of cultures of the races to which they were resistant. After inoculation, races incapable of causing wilt in a variety were checked in the outer cortical layers of the roots.

157 **Thirty-Sixth Report and Accounts of the National Institute of Agricultural Botany, Cambridge 1955 :** Pp. 54.

Trials have been carried out on forage grasses, red clover, swedes, rape, mustard and *Camelina sativa* for oil, carrots, onions, kale and lettuce.

Wheat. Forty-one varieties of winter wheat were tested at 14 localities.

Oats. Six varieties of winter oats and 21 varieties of spring oats were tested at 8 and 21 centres respectively. The best yields of early spring oats were given by Forward, Lightning and Maldwyn.

Maize. Of the grain varieties, none of the 29 experimental hybrids tested yielded as well as Prior or Matador. W.341A gave the best results of the silage varieties.

Barley. Seventeen barley varieties were tested at eighteen centres. In trials under four nitrogen treatments, Rika outyielded Proctor at two of the four localities under all conditions.

Lucerne. Orchésienne, Eynsford, W268 and Flamande gave the best yields of the 26 varieties tested.

Lupin. Weiko III and Borre were the most promising sweet varieties.

Mangel. Eureka, Gullåker Red Øtofte XI and White Øtofte XI gave the highest dry matter yields in an international trial grown at Cambridge on behalf of FAO.

Potato. Trials have been carried out of varieties and selected clones in respect of rate of bulking, rate of degeneration due to virus infection, comparisons of fresh seed and once-grown local stocks and cooking quality.

Sugar beet. Nine strains are recommended for commercial use, and four provisionally recommended. Hilleshög Polyploid gave good yields of sugar but showed only moderate resistance to bolting while Johnson's N showed the greatest bolting resistance. In early sown trials for the study of bolting KNB continued to show high resistance.

Linseed. Svalöf oil flax II contained to do well and generally outyielded Valuta, Dæhnfeldt élite 6 is a promising late variety, and B1528 is the best early variety. In the trial in which it was included, Pastel outyielded Dakota and Valuta.

Cabbage. Early Covent Garden gave the greatest yield of Savoy cabbages but produced more loose heads; Best of All and Green Curled Dwarf were markedly earlier than any other variety tested. Harbinger was the earliest and Rous Lench the latest of the spring cabbages tested, but Early Durham gave the greatest weights of greens at early cuttings. Of the red cabbages Cambridge Red and Langedyke gave similar yields and were both superior to Niggerhead, but in pickling-quality tests Cambridge Red had a colour advantage over Langedyke.

Cauliflower. Seal-Hayne is the best of the winter varieties and October and Lucifer of the spring varieties. Pioneer and Early Snowdrift are superior in quality to the other early summer varieties, although Cambridge 8 gives a higher yield.

Brussels sprout. For the second year 7/52 has given good yields of high quality, 73/53 is a promising early variety and 46/52 is the best of the types suitable for quick freezing.

Tomato. Amateur matured early and gave good yields but its fruit quality was poor. Sunrise gave the greatest proportion of bilocular fruit and the F_1 hybrids Ware Cross and Star were promising.

Broad bean. Throws MS and L12B were the most promising winter varieties. In trials from 1953–55 Throws MS generally outyielded Gartons' SQ by an average margin of 5%. Suffolk Red and Danish Horse are promising spring varieties.

158 **Plant breeders' conference at Cambridge.**

Nature, Lond. 1956 : **178** : 353–54.

An account is given of the Seventh Meeting of Plant Breeders convened by the Agricultural Research Council and held in July 1956 at the Plant Breeding Institute, Cambridge. R. Riley outlined work on the introduction into wheat of chromosomes from primitive related species and from rye. K. F. Thompson discussed the problem of sporophytic incompatibility with special reference to the possibility of using clones for the production of commercial double-cross seed of uniform types of marrow-stem kale. J. L. Fyfe gave a survey of the outlook for herbage breeding, which included an examination of the general possibilities of applying methods based on the system used in hybrid-maize production. J. M. Drayner described observations on the breeding system and heterosis in field beans. G. E. Russell discussed the relationships between virus strains in connexion with the problem of virus yellows in sugar beet. A. R. Trim spoke of his work on the nucleic acids of sugar beet, in relation to both genetical aspects and virus yellows. F. G. H. Lupton discussed methods of selection for yield in breeding cereals. R. N. H. Whitehouse dealt with the choice of parental combinations in cereal breeding by means of diallel crosses. H. W. Howard described investigations on a potato chimera which arose in a stock of King Edward. In addition, a wide range of work on cereals and other crops was demonstrated in the field and laboratory.

159 SANDISON, A.

Testing crop varieties.

Agric. Merch. 1956 : **36** : No. 7 : 88–91.

In this outline of the varietal testing procedures adopted by the National Institute of Agricultural Botany, England, the topics mentioned include testing for yield, experimental lay-out, analysis of results, regional trials and testing for disease resistance and quality.

160 **Guide to varieties of field and vegetable crops under trial, observation and propagation.**

Nat. Inst. agric. Bot. 1956 : Pp. 80.

This booklet gives information on the variety trials, observation plots and other experiments being carried out on field and vegetable crops at the Cambridge headquarters of the institute and subsidiary stations in England, Wales and Scotland. Part 5 lists the pedigrees and places of origin of the cereal varieties under investigation.

161 Vědecká diskuse o šlechtění zemědělských poldin v ČSR. (**Scientific discussion on the breeding of agricultural plants in the Czechoslovakian Republic**).

Česk. Akad. Zeměd. Věd. Praha, 1956 : Pp. 70. (Mimeographed).

An abridged report on a recent conference in Czechoslovakia dealing with breeding work on agricultural and horticultural plants is presented. Mičurinism, polyploidy, heterosis and other related topics were discussed. Among the crops mentioned are wheat, rye, maize, lucerne, red clover, potato, sugar beet, flax and linseed, poppy, tomato and vines.

162 ADAMEC, JA.
(Science at the service of the people).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 6 : p. 21. [Russian].

Among the Czechoslovakian achievements in breeding of agricultural plants, mention is made of a new wheat variety Kaštice which is notable for high yield, grain quality and resistance to lodging. The new potato variety Ambra, which is as early as Erstling, is notable for wart resistance and good flavour.

163 KARMACSI, B.
Szemelvények a kertészeti osztály 1950. évi kísérleteiből. (Hazai káposztamagtermesztés az ötéves tervben). [**Information on some of the experiments carried out by the horticultural division in 1950. (Native cabbage seed production under the five-year plan)**].
Debrecen. Mezőgazd. Kísérl. Intéz. Évkön. 1950 : **1** : 157–64.

Work carried out at the Debrecen Agricultural Experimental Institute in 1950 included the selection and breeding of local varieties of winter cabbage and investigations on the fruit characters of 143 walnut trees.

164 **Hungary produces a new beer barley.**
World Crops 1956 : **8** : p. 201.

The following new crop varieties produced at Hungarian experimental stations are noted: at Martonvásár, a malting barley, FB104, of high quality and productivity; at the same station, the pea Martonvásár Record, a hardy, high-yielding variety for dry areas; at the South-East Transdanubian Agricultural Experimental Institute, the sunflower Ireg Early Striped, giving a very high yield of oil; at the Nyirség Agricultural Experimental Institute, three productive potatoes, Prosperous, Kisvárda Rose and Lilla; and at the Horticultural Research Institute, the red pepper Cecei 3 Sweet Dessert, a mild variety suitable for canning.

165 FAVERO, A.
Novità nelle razze elette. **(Novelties in improved varieties).**
Sementi elette 1956 : **2** : No. 5 : 58–60.

Reference is made to the German potato varieties Eva, Franziska and Line 14 and to new maize and rice hybrids. Asgrow Maygold 99AA is a yellow dent maize which ripens in 130–135 days and is described as suitable for good and medium soils all over Italy. Asgrow 420 W is a white dent, ripens in 135 days and is suitable for sowing where an early crop is required. The rice Nano Roncarolo is a hybrid of Lady Wright x Balilla characterized by short straw 70 cm. high. The other rice, Gianduia, is described as highly resistant to diseases and lodging.

(Summarized report on scientific research for the year 1953).
Vsesojuzn. Naučno-Issled. Inst. Masličn. Kuljtur, Krasnodar 1954 : Pp. 342. [Russian].

166 *Ždanov, L. A. (Breeding and seed growing of the sunflower). (pp. 5–13).*

The new varieties Don 309, K306 and D695, all notable for high oil content, were bred at the Don Research Station, and the oil contents of the *Orobanche*-resistant standards 8381 and Stepnjak [Steppe] were improved. Material with an oil content up to 46% has been selected. The yield and oil content of some vegetative hybrids and rust-resistant interspecific hybrids between the cultivated sunflower and *Helianthus ruderalis* have been improved.

167 *Pustovoĭt, V. S. (Breeding and seed growing of the sunflower). (pp. 14–26).*

A number of early and midseason varieties highly productive of oil and seed have been bred at Krasnodar. Among the early forms are 15013, 15040 and 15097, which have a higher oil content and produce more oil per given area than 8883. Among the new midseason types, 14443, 14266, 14263 and the rust-resistant interspecific hybrids 14905 and 14902 show similar improvements over 8931. Other newly bred sunflowers include forms that reach maturity 3–5 days earlier than 8883 and hybrids of *Helianthus tuberosus* with the cultivated sunflower variety 8931. The hybrids are characterized by high yields.

168 *Romanjuk, G. T. & Ščerbina, V. I. (Breeding and seed growing of the sunflower). (pp. 27–31).*

This account of breeding work at Armavir mentions a new midseason variety, 9347, with an oil content of 49·5%. It yields 20% more oil per ha. than 1646. In the 1953 trials, Armavir 3497 produced the most oil. Armavir 9343 and Armavir 9345 are both notable for early maturity, *Orobanche* resistance and high oil-contents.

169 *Tarančuk, M. L. (A summarized report on achievements in breeding* Orobanche-*tolerant varieties of sunflower). (pp. 32–34).*

Some new varieties from Voronež show resistance to race B of *Orobanche*. They are all more productive of oil and seed than the *Orobanche*-susceptible standard Černjanka 11a and have a lower husk content. Some forms also exceed it in earliness.

170 *Zdorik, L. F. (Breeding and seed growing of the sunflower). (pp. 35–37).*

Borskoe 1 was bred at the Borskoe Field Research Station. It has a higher oil content than Saratov 169 and Černjanka 35, the standards in the Kuĭbyšev province, and surpasses these also in earliness and yield. In recent trials the early varieties VNIIMK 8932 [Oil Plants Institute 8932] and VNIIMK 8883 have shown resistance to *Orobanche* and were more productive of seed and oil than Saratov 169. Breeding work is in progress on early forms, obtained by single plant selection from VNIIMK 8932 and VNIIMK 8883.

171 *Mjakuško, Ju. P. (The selectivity of fertilization in the sunflower). (pp. 38–43).*

At Krasnodar, VNIIMK 1646 was pollinated by self pollen + foreign pollen of one, two, three or five other varieties. It was found that the percentage of selfing always exceeded that of hybridization and that the proportions of selfs to hybrids were different for each variety that supplied the pollen. The fewest selfs and the most hybrids were obtained when the pollen mixture comprised many varieties. The hybrids had always inferior economic characteristics even in the case where the pollen mixture included low-husk varieties high in oil.

172 *Mjakuško, Ju. P. (Trials of intervarietal hybrids of sunflower). (pp. 44–45).*

The substance of this article was reported in *PBA*, XXV, Abst. 1326.

173 *Moškin, V. A. (Breeding and seed growing of the castor-oil plant). (pp. 50–57).*

Mention is made of new varieties of *Ricinus* bred at Krasnodar, especially 849/43 which outyields Sanguineus 401 and ripens 5 days earlier. It is characterized by indehiscence, tall stem and productive central branches. Other new varieties include 1498/49 and Sanguineus Melkosemjannyĭ [Small-seeded Sanguineus] which are notable for high yield, drought resistance and a habit suitable for combine harvesting.

174 *Menjaĭlova, A. A. (The results of trials of some varieties of the castor-oil plant). (pp. 58–60).*

Don 39/44 was selected at the Don Research Station. It is an indehiscent variety with large seed and outyields Don 172/1, the standard in the Rostov province, by 11%.

175 *Peršin, N. M. (Selectivity of fertilization of the castor-oil plant). (pp. 61–65).*

An account of intervarietal hybridization, together with observations on multiparental pollination and restricted open pollination, at Krasnodar is given. The hybrids of Sanguineus 401 x VNIIMK 165 and Sanguineus 401 x Gibrid Ranniĭ [Early Hybrid], were obtained by artificial hybridization. They outyield Sanguineus 401 by 38·4% and 30·2% respectively and are notable for early maturity, large seed and tall habit.

176 *Safonov, M. D. (Breeding linseed). (pp. 66–73).*

This report on breeding work at Voronež mentions hybrid 930 x K48 and the new variety A26 which outyield the standard 1308. A26 was obtained by intravarietal hybridization of 1308.

177 *Umen, D. P. (Breeding sesame). (pp. 74–76).*

A number of indehiscent varieties which shed their leaves before maturity were obtained by hybridization between varieties from the Oil Plants Institute and unspecified Japanese forms at Krasnodar. Most outyield Kubanec [Kubanj Dweller], the standard in the Krasnodar territory. The best among them are 78/1947 and 76/1947.

178 *Kartamyšev, V. G. (A form of sesame with six locules). (pp. 77–81).*

An unspecified strain of sesame at the Don Research Station gave rise to plants each of which bore capsules of different kinds; some were characteristic of *Sesamum indicum* ssp. *bicarpellatum*, others of *S. indicum* ssp. *quadricarpellatum*, while others still were of an intermediate type, i.e. with three carpels and six locules. Each form bred true. A number of forms with three carpels were selected. These are characterized by high yield, white seed, uniform maturation, resistance to diseases and leaves shed at maturity.

179 *Ždanov, L. A. (Breeding* Brassica juncea *for high oil content). (pp. 87–94).*

This account of breeding work at the Don research station mentions new forms which produce more oil per given area than such standards as Stalingrad 2. The principal methods used were intervarietal open pollination and selection for yellow seed, but some productive forms were obtained by distant hybridization. Worth mentioning among these latter are G277 and G278, both said to be hybrids of *Brassica juncea* x *Camelina sativa*.

180 *Voskresenskaja, G. S. (New perilla varieties). (pp. 96–98).*

Recent selections from Krasnodar, especially 208 and 380, outyield Seraja Hozjaĭstvennaja [Grey Industrial] and the standard 501.

181 *Pančenko, A. Ja. & Mitjukevič, V. A. (Hybrids between sunflower and the Jerusalem artichoke). (pp. 115–19).*

By employing vegetative rapprochement, incompatibility between *Helianthus annuus* and *H. tuberosus* was overcome and some fertile interspecific hybrids obtained. Some F_4 hybrids are immune from *Puccinia*, outyield the cultivated sunflower and have approximately the same values as the latter for 1000 seed weight and husk and oil contents.

182 *Lakiza, R. I. (The effect of length of day upon the proportion of male and female flowers in the castor-oil plant). (pp. 120–23).*

Long day promoted the development of the ♀ flowers in the variety Kruglik 5, at the expense of the ♂ flowers. The process was reversed when the plants were subjected to short days.

183 Cicin, N. V.
(For continued progress of I. V. Mičurin's theory).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1955 : No. 23 : 3–10. [Russian].

The content of this article is substantially the same as in *PBA*, XXVI, Abst. 2133.

184 Ødelien, M.
Årsberetning fra Norges Landbrukshøgskole for budsjettårene 1. Juli 1953–30. Juni 1955. **(Annual Report of the Agricultural College of Norway for the financial years 1 July 1953 – 30 June 1955)** : 1956 : Pp. 141.

It is noted that the work of the Institute of Genetics and Plant Breeding of the Agricultural College of Norway has included genetical studies of barley and spinach, interspecific hybridization of lupins, mutation studies, investigations on polyploidy in lupin, clover and lucerne and research on frost resistance.

Jord—Gröda—Djur. Svensk Jordbruksforskning Årsbok 1955. **(Soil—Crops—Animals. Swedish Agricultural Research Year Book 1955)** : Pp. 304.

185 *Åkerman, Å. Halten råprotein och fett hos några viktigare vithavresorter. (The content of crude protein and fat in some important white oat varieties). (pp. 80–84).*

Using Seger [Victory] as standard, comparative analyses were made of two Swedish land races, Guldregn I [Golden Rain I], Guldregn II, Örn [Eagle] and Sol II [Sun II]. All the varieties except the two land races and Guldregn I gave higher grain yields than Seger, and all without exception had a higher crude protein content. Intervarietal differences in fat content were small but consistent, Örn having the highest content.

186 *A., C. E. & H., A. Mältningstendensen hos diploid och tetraploid råg. (The malting tendency in diploid and tetraploid rye). (p. 85).*

In Sweden, tetraploid ryes show less tendency to germinate in the ear than diploid varieties. Diastatic activity in tetraploids grown in Skåne was high but was nevertheless lower than in comparable samples of diploids.

187 *Hagberg, A. Tetraploidernas konstans och risken för inkorsning och inblandning vid fältodling. (The stability of tetraploids and the risk of cross pollination and contamination in field cultivation). (pp. 86–92).*

Some difficulties involved in maintaining purity in tetraploid crops grown for seed are discussed with particular reference to rye and clover. Seed yield of tetraploid clover is markedly reduced by the presence of 1–2% of diploids in the field and is halved by the presence of 4%, while in rye 4% diploids have little effect but 16–32% reduce yield by about 20%. In preliminary tests in Sweden, an isolation distance of 100–200 m. from diploid clover fields has proved satisfactory in protecting tetraploid material from diploid pollen. Since clover seeds remain viable in the soil over long periods, it is further suggested that tetraploid clover should not be grown where diploid varieties have been grown previously. So far, there has been little evidence in Swedish material of spontaneous production of diploids from tetraploids. A small percentage of aneuploids appears regularly among tetraploid progenies and attempts are in progress to reduce the aneuploid frequency by selection for high fertility.

188 *H., A. Syntes av kålrot.* (*Synthesis of swede*). (*p. 93*).

With the aim of synthesizing swede, tetraploid turnips were crossed with tetraploids of cabbage, Brussels sprouts and marrow-stem kale. From the 30,000 flowers crossed, seven plants resembling swede were obtained. The F_2 progenies were highly variable, but all had the enlarged roots of the turnip parent and some individuals, outstanding in form and size, appeared equal or superior to normal swede. Crossing is now in progress between tetraploid turnip and tetraploid kohl rabi, in an attempt to combine the swollen root of the former with the thickened stem of the latter.

189 *B., G. Sex nya holländska potatissorter.* (*Six new Netherlands potato varieties*). (*p. 109*).

Notes are given on Ullenborg, Surprise, Professor Broekema, Regina and Bea (cf. *PBA*, XXVI, Abst. 2501) and on Koopmans Bonte [Koopman's Mottled], a medium-late variety of good storage quality, developed from a cross involving Koopmans Blauwe [Koopman's Blue].

Jord—Gröda—Djur. Svensk Jordbruksforskning Årsbok 1956. (**Soil—Crops—Animals. Swedish Agricultural Research Year Book 1956**) : Pp. 352.

190 *K., L. Artificiella embryokulturer.* (*Artificial embryo cultures*). (*p. 96*).

A brief survey of the use of embryo culture in hybridization studies is given, mention being made of the successful use of this technique in growing *Prunus* hybrids and barley x rye hybrids.

191 *Julén, G. Förädling och fröodling av lucern.* (*Breeding and seed production in lucerne*). (*pp. 97–103*).

The chief improvement required in lucerne in Sweden is the ability to set seed satisfactorily under Swedish conditions. Progress towards this objective has been made at Svalöf by incorporating the good seed-setting qualities of *Medicago falcata* into *M. sativa* by crossing and back crossing. A number of lines of the hybrid material have given good seed sets both when cross pollinated and when selfed, but so far none of the lines equals the commercial lucerne varieties in forage yield.

192 N.-L., G.
Nya originalsorter. (**New original varieties**).
Försök o. Forskn. 1956 : **13** : 36–37.

The new varieties mentioned below have received the designation "original".

The Svalöf winter wheat Diana (Sol II x Svea II) ripens very early, has stiff straw, is very winter hardy and has done particularly well in Värmland.

The Hammenhög greenhouse cucumber Filia OJO/54 is an F_1 hybrid of two highly inbred lines from older varieties; it is earlier and more productive than the best rough-skinned commercial varieties.

Two new winter dills have been developed, viz. the Hammenhög variety Pikant 2415 OJO/54, originating from hybridization in common dill and having high yielding ability, stiff stalks, rapid growth and strong flavour, and the Weibull variety Tetra W : s/55, which arose through chromosome doubling in common dill and is characterized by earliness, coarse growth and high yield.

Previously described varieties also recognized as original are: the Hammenhög mangel Kofor Barres (cf. *PBA*, XXV, Abst. 353); the Hammenhög cocksfoot Coxa (cf. *PBA*, XXV, Abst. 2054); the Weibull perennial ryegrass Viris (cf. *PBA*, XXIII, Abst. 1989); the Hammenhög tomato Potentat II/54 (cf. *PBA*. XXII, Abst. 1519) and the Hammenhög fodder pea Valör [Value] (cf. *PBA*, XXV, Abst. 2525).

193 1e jaarverslag. Proefstation voor de Groenteteelt in de volle grond in Nederland. (**First annual report. Experimental station for vegetable growing in the open in the Netherlands**). Alkmaar 1954–1955 : Pp. 55.

Potato. Attempts are being made to breed an early, wart-resistant potato to replace Eersteling, which is highly susceptible to wart. Other objectives include resistance to nematodes and late blight and good tuber quality.

Cucumber. Priority is being given to the development of new early-maturing outdoor varieties with long, dark-green fruits; drought resistance is also of importance. Hoffmann's Giganta, the Czech variety Mladá Boleslav and two unspecified Japanese varieties gave the best results in recent trials.

Tomato. Intervarietal crosses are being effected with a view to obtaining outdoor strains that will mature earlier than Moneymaker and yield fruit of the same, or better, quality.

Beans. Data on the principal morphological and physiological characters of the main varieties of French bean grown in the Netherlands are provided (cf. *PBA*, XXVI, Abst. 1893). Attempts are being made to develop French bean varieties resistant to inclement weather conditions and capable of growing at low temperatures. Crosses have been carried out between *Phaseolus vulgaris* on the one hand and *P. dumosus* and *P. coccineus* on the other (cf. *PBA*, XXVI, Abst. 1894).

Pea. The new maple pea varieties Koroza and Eroica, both bred at the above station, are described. Koroza matures very early and is resistant to top yellows and foot rot. It gives high yields of large peas of good quality. Eroica is susceptible to top yellows but resistant to foot rot. It matures late and is suitable as a replacement for the long-strawed land races commonly grown in the northern parts of the province of Holland. The peas, which are exceptionally large, are of good quality.

194 Korte beschrijving van de nieuwe rassen, welke in 1956 op de interprovinciale proefvelden worden beproefd en niet voorkomen in de 31ste beschrijvende rassenlijst voor landbouwgewassen 1956. (**Short description of the new varieties that were tested on the interprovincial trial fields in 1956 and do not occur in the 31st descriptive variety list of agricultural crops, 1956**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1956 : **13** : 3–7.

Brief information is presented on the pedigree and agronomic merits of varieties of spring wheat, spring barley, oats, maize, peas, beans, flax, opium poppy and potatoes tested in interprovincial trials in the Netherlands in 1955 but not included in the 1956 descriptive variety list (cf. *PBA*, XXVI, Abst. 3123 and p. 701).

195 Lungu, I.
(**Achievements in agronomy in the Rumanian People's Republic**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 7 : 44–45. [Russian].

Mention is made of training spring cereals for the winter habit and of high-yielding varieties of wheat and oats thus obtained at Tîrgu Frumos. A short-stemmed cotton variety suitable for combine harvesting was obtained by intravarietal hybridization. It has fibre 0·1–0·5 mm. longer than Odessa 1 and is 2–10 days earlier.

Annual Report of the National Institute of Genetics, Japan 1951 (1952) : No. 2 : Pp. 70.

196 *Matsumura, S. Radiation genetics in Einkorn wheat.* (*pp. 24–25*).

Further to the studies reported in *PBA*, XXII, Abst. 2580, dormant grains of *Triticum monococcum* were exposed to 5400–13500 r. of 180 KVP X rays. The frequency of chromosome aberrations rose parabolically with the dose but decreased with increase of wave length. Mutation rate appeared to depend both on dose and wave length.

197 *Matsumura, S. Nullisomic dwarfs in* vulgare *wheat and gigas-plants in their offspring.* (*pp. 25–26*).

Cf. *PBA*, XXVI, Abst. 2180.

198 *Matsumura, S. Studies on* Agropyrum, *a genus related to* Triticum. (*p. 26*).

A sterile F_1 hybrid has been obtained between *T. polonicum* and *A. glaucum*. The modal number of bivalents is 7_{II}; it is inferred that the homologous genome shared by the two species is the B genome.

199 *Fujii, T. Morphologically different twins found in the progeny of a hybrid wheat.* (*p. 26*).

Cf. *PBA*, XXIV, Abst. 2833.

200 *Takenaka, Y. Cytogenetic studies on the genus* Nicotiana *II.* (*pp. 27–28*).

Chromosome counts of *N. alata*, *N. longiflora*, *N. paniculata*, *N. tomentosiformis*, *N. trigonophylla*, *N. undulata*, *N. nudicaulis*, *N. rustica*, *N. suaveolens*, *N. gossei* and *N. rotundifolia* are reported, the numbers agreeing with those already published. Pollination of *N. glutinosa* by *N. sylvestris* produced 1 dwarf plant with $2n = 24$ chromosomes, 20 presumably parthenogenetic *N. glutinosa* offspring and 1 *N. sylvestris* plant. Hybrids with $2n = 22$ chromosomes were obtained from *N. glauca* x *N. plumbaginifolia*; meiosis was highly irregular and no seeds set.

201 *Takenaka, Y. & Lilienfeld, F. A. Cytogenetic studies on the genus* Nicotiana *III.* (*pp. 28–29*).

Hybrids of *N. tabacum* x *N. sylvestris* are described. They are similar in appearance to *N. tabacum* but flower 10 days earlier. The meiotic configuration $3_{III} + 9_{II} + 9_{I}$ was frequent, suggesting some degree of semihomology between the *tomentosa* and *sylvestris* chromosomes.

202 *Matsumura, S. & Fujii, T. Mutations in tobacco induced by X-rays.* (*p. 29*).

Cf. *PBA*, XXVI, Abst. 1567.

203 *Sakai, K., Gotoh* [*Goto*], *K. & Iyama, S. Studies on the relative weight of mid-rib in* Nicotiana tabacum *leaves.* (*p. 30*).

Cf. *PBA*, XXV, Abst. 3295.

204 *Sakai, K. Genetic studies on some fruit characters in* Capsicum annuum. *(p. 31).*

From a large number of crosses it is concluded that: (1) fruit weight per plant is heterotic in some crosses but not in others; (2) the smaller number of fruits per plant in a cross is usually incompletely dominant; and (3) small fruit size is partially dominant.

205 *Suzuki, Y. Decline of fruit productivity by artificial selfing in* Capsicum annuum. *(pp. 31–32).*

Fruit production was compared in selfed and open-pollinated progenies of four strains. Fruit number, fruit weight and top weight were less in the selfed progenies but no significant difference was noted in ripe-fruit number, plant weight excluding fruits, and average weight per fruit.

206 *Gotoh [Goto], K. Studies on developmental processes of fruits in eggplants. (pp. 32–33).*

Gotoh [Goto], K. Regression analysis of fruit-shape and -size genes with the aid of F_1 hybrids in eggplants. (p. 32).

Cf. *PBA*, XXIV, Abst. 1513.

207 *Gotoh [Goto], K. Studies on combining ability in eggplant varieties. (pp. 33–34).*

The yielding capacities of 15 F_1 hybrids involving 10 varieties were ascertained. Five combinations outyielded both parents. The variety Tsurubososennari appears to have high general combining ability. Evidence was also obtained of specific combining ability in some varieties (cf. *PBA*, XXIII, Abst. 1571).

208 *Takenaka, Y. Cytogenetic studies on the sex in* Cannabis sativa *L. I. (pp. 35–37).*

A spontaneous autotetraploid female was discovered in 1950 from which a progeny of triploid males, females and intersexes was obtained following open pollination. Meiosis in the triploids is described. The modal metaphase configuration was $6_{III} + 4_{II} + 4_{I}$; chromosome segregation was comparatively regular and fertility was quite good.

209 *Takenaka, Y. Irregular mitosis in some clones of the genus* Colchicum. *(pp. 37–38).*

Various cases of chromosome aberrations in clones cultivated in Japan are described. Environmental factors appear to have a strong influence on the incidence of these abnormalities, which, it appears, may arise in somatic tissue and competitively replace normal cells.

210 *Miyazawa, A. Sterility in* Phaseolus multiflorus. *(p. 39).*

A case of pollen sterility at Mishima was investigated. A number of minor meiotic irregularities, thought to be due to the high local temperature, were noted. These however were hardly sufficient to account for the high degree of sterility observed.

211 *Matsumura, S. Improvement of sugar beets by means of induced triploidy. (p. 40).*

Cf. *PBA*, XXVI, Absts. 3569–79.

212 *Furusato, K. Genetics and breeding of* Citrus. *(pp. 41–42).*

The Unshu (= Satsuma) mandarin usually sets parthenocarpic fruits in Japan since its pollen aborts at high temperatures. Sexual seed can be obtained from self pollen late in the season. An investigation of polyembryony in *Citrus* showed that the number of embryos can be high (20–30 in the Unshu mandarin). Polyembryony appears to be inherited maternally.

213 *Furusato, K. Induced polyploidy in some cultivated plants and its utilization. (p. 42).*

Medicago denticulata. A tetraploid race had longer, thicker and fewer stems than the diploid type.
Melon. A thick-fleshed deep-coloured tetraploid strain has been obtained by colchicine treatment of Nara 1.
Water melon. Two artificially induced tetraploid strains have been interplanted with diploids in the hope of obtaining new superior triploids. The effect of grafting triploids on various cucurbit stocks was investigated.

214 *Matsumura, S. & Itô, T. Studies on some lower organisms. (pp. 42–43).*

Various mutants have been obtained by doses of 5000–150,000 r. A strain with a streptomycin potency 10–20% above normal was obtained by low-dose irradiation.

215 *Sakai, K. Experimental demonstration of the theory of variance increase due to competition in plant populations. (pp. 47–48).*

An analysis of variance of yield data from pure and mixed sowings of three wheat varieties showed that a significant variance component due to intergametophytic competition was present in some varietal combinations but not in others. Biometrical genetical studies which ignore the possible effects of competition are liable, therefore, to be at fault.

216 *Sakai, K. Competition studies with six varieties of rice. (pp. 48–50).*

A comparable study to that reported in Abst. 215 but using 6 rice varieties is reported. The varieties were rated according to competitive ability using a standard error scale ranging from — 6·5 to +3·5.

217 *Sakai, K. Theoretical studies on selection in the breeding of autogamous plants. (pp. 50–53).*

Formulae are given for the frequency of genotypes after *n* generations, assuming independent assortment at two loci and differential selection. It is shown that the efficacy of a single mass-selection in a hybrid bulk increases with the number of generations (cf. *PBA*, XXV, Abst. 2642).

218 *Kimura, M. Fluctuations of adaptive values and the frequency distribution of heterotic genes in natural populations. (pp. 53–56).*

Formulae are derived for (1) the long-term distribution of gene frequencies determined by random fluctuation and (2) changes in gene frequency due to cyclic and random fluctuation in selective values.

219 *Kimura, M. Process of irregular change of gene frequencies due to the random fluctuation of selection intensities. (pp. 56–57).*

The Markov process which results from random fluctuation in selection intensity over many generations is investigated mathematically. Formulae are derived for gene frequency changes for cases involving no or complete dominance.

220 *Kimura, M. On "effective size of populations". (pp. 57–60).*

A discussion of the ways in which effective size of population is controlled by number of effectively breeding individuals, sex ratio, selfing, and overlap of generations is presented.

221 *Kimura, M. On the process of decay of variability due to random extinction of alleles. (pp. 60–61).*

Formulae are given for the probability of fixation or extinction of an allele in a small population after *t* generations, using the moments of distribution as the basis for calculation.

222 *Kimura, M. Process of recombination of chromosome segments in a random breeding population. (pp. 61–64).*

Cf. *PBA*, XXIV, Abst. 2609.

223 *Kimura, M. Method of mating-operators and its application to the study of partially self-fertilizing populations. (pp. 64–65).*

A method of tracing recombination of chromosome segments through successive generations is described. Let H_n be the frequency of heterozygous chromosome pairs in the *n*th generation. Then the random-mating operator f_∞ is defined so that $f_\infty H_n$ represents the frequency of heteroxygous pairs after one generation of selfing, while the selfing operator f_1 represents the corresponding frequency after selfing. These operators satisfy the distributive law but $f_1 f_\infty \neq f_\infty f_1$. The application of the method to partially self-fertilizing populations is considered.

224 *Kimura, M. Statistical theory on the pre- and post-reduction of chromosomes. (pp. 65–66).*

Cf. *PBA*, XXIV, Abst. 20.

Annual Report of the National Institute of Genetics, Japan 1952 (1953) : No. 3 : Pp. 69.

225 *Matsumura, S. Irradiation experiments with X-rays in Einkorn wheat. (pp. 36–37).*

The relations between frequency of chromosome aberrations, mutation rate, dose and wave length reported in Abst. 196 were confirmed. A list of induced mutants is given; the early and giant mutants are of possible value in breeding.

226 *Matsumura, S. & Fujii, T. Effect of ultra short wave irradiation on Einkorn wheat. (pp. 37–38).*

Cf. *PBA*, XXV, Abst. 2914.

227 *Matsumura, S. Cytogenetic studies of wheats and their relatives. (p. 38).*

The studies on nullisomic dwarfs reported here have been referred to already in *PBA*, XXVI, Abst. 2180.

It is also mentioned that the cross *Triticum vulgare* x *Agropyron glaucum* has been accomplished. *A. triticeum* has been treated with colchicine to obtain tetraploids.

228 *Lilienfeld, F. A. Cytogenetical problems in the genus* Nicotiana. *(pp. 38–39).*

Meiosis in *N. sylvestris* x *N. tomentosiformis* and its amphidiploid is described. In the diploid, 0–5 loosely associated bivalents are found; the plants are sterile. Meiosis in the amphidiploid is quite regular; the plants produce good pollen but are female-sterile.

229 *Matsumura, S. & Fujii, T. Irradiation experiments with X-rays in* Nicotiana. *(pp. 39–40).*

Cf. *PBA*, XXVI, Abst. 1567.

230 *Takenaka, Y. Cytogenetic studies on the genus* Nicotiana *IV. (pp. 40–42).*

Meiosis in the following hybrids is described: *N. glauca* x *N. alata, N. glauca* x *N. plumbaginifolia, N. longiflora* x *N. glauca, N. tabacum* x *N. sylvestris, N. tabacum* x *N. glauca, N. glutinosa* x *N. tabacum, N. suaveolens* x *N. gossei, N. suaveolens* x *N. longiflora* and *N. suaveolens* x *N. plumbaginifolia.* Meiosis in *N. longiflora* x *N. glauca* was more irregular than in the reciprocal studied by Kostov; otherwise the observations were largely in agreement with Kostov's findings. (Cf. Abst. 201).

231 *Sakai, K., Gotoh [Goto], K. & Iyama, S. Genetical studies on the midrib proportion and the leaf-shape in tobacco plants. (pp. 42–44).*

Cf. *PBA*, XXV, Abst. 3295.

232 *Gotoh [Goto], K. Genetic studies on eggplant* (Solanum melongena *L.*). *(pp. 44–46).*

Cf. *PBA*, XXIV, Absts. 1512–3.

233 *Endô, T. Inheritance of fruit color in* Capsicum. *(pp. 46–47).*

The genetics of fruit pigmentation was studied in the F_1, F_2 and back-crosses of Takanotsume x Goshiki. The minimum number of genes for intensity of chlorophyll pigmentation was estimated as 1·39; the corresponding value for the area of anthocyanin pigmentation was 1·18.

234 *Miyazawa, A. On genes controlling quantitative characters in* Capsicum annuum *L. (pp. 47–48).*

The genetics of various fruit and leaf characters was studied in the F_1–F_2 of Takanotsume x Chinese. The minimum number of genes controlling the various characters was estimated as follows: fruit weight, 52·24; fruit length, 0·79; fruit width, 9·52; leaf length, 1·59; leaf width, 7·92; petiole length, 0·04; and number of seeds per fruit, 6·51. It was noted that the numbers of genes controlling width of an organ were higher than those determining length of the same organ.

235 *Takenaka, Y. Cytogenetic studies on sex in* Cannabis sativa *L. II. Meiosis in diploid, triploid and tetraploid males. (pp. 48–50).*

Meiosis in 2*n*, 3*n* and 4*n* male plants is described. In the 2*n* plants a conspicuous heteromorphic pair is evident. The modal configuration of the triploids is $9_{III} + 1_{II} + 1_{I}$; the sex-chromosome complex appeared to be Y–X–X. In the tetraploids, 18–20 bivalents were formed; the sex-chromosome complexes were of the forms Y–Y, X–Y, Y–X–X–Y and Y–X–Y in descending order of frequency. (Cf. Abst. 208).

236 *Matsumura, S. Improvement of sugar beets by means of induced triploidy. (pp. 50–51).*

Cf. *PBA*, XXVI, Absts. 3569–79.

237 *Furusato, K. Tetraploidy in citrus. (pp. 51–52).*

Spontaneous tetraploids have been detected in the following citrus types: Yuzu, *Poncirus trifoliata*, Unshu (= Satsuma) mandarin, Natsudaidai [Summer Orange] and *C. aurantium.*

238 *Furusato, K. Abnormal growth of citrus trees caused by deviating chromosome numbers in the grafting stocks. (pp. 52–53).*

A comparatively high incidence of tetraploidy has been observed in Japanese citrus rootstocks. Such stocks depress the growth of the scions.

239 *Furusato, K. & Miyazawa, A. Prospects of using triploids in tobacco breeding. (pp. 53–54).*

Triploids have been produced by 4*n* x 2*n* crosses of Bright Yellow, Judy's Pride and Xánthe. The resulting plants were highly variable morphologically so that their value was hard to assess.

240 *Iino, T. Appearance of reversional mutants in the methionine-requiring strain of* Ustilago maydis. *(pp. 54–55).*

Cf. *PBA*, XXIV, Abst. 119.

241 *Sakai, K. & Suzuki, Y. Competition between diploid and autotetraploid plants of barley. (pp. 56–57).*

Cf. *PBA*, XXV, Abst. 1983.

242 *Sakai, K. & Suzuki, Y. Competition between an artificially synthesized amphidiploid and its ancestral species of* Abelmoschus. *(pp. 57–58).*

Competitive abilities of *Hibiscus* (*Abelmoschus*) *esculentus, H. manihot* and their amphidiploid hybrid were ascertained from a comparative study of the growth of the three types in pure and mixed sowing. The amphidiploid proved to have the greatest competitive capacity.

243 *Sakai, K. & Gotoh [Goto], K. Intervarietal difference in competitive ability in* Hordeum sativum *L. and* Oryza sativa *L. (pp. 58–59).*

Comparable studies to those summarized in

Absts. 215–16 are reported, using 12 barley varieties and 5 further rice varieties. In both experiments intergenotypic differences in competitive ability were discovered.

244 *Sakai, K. & Suzuki, Y. Competition between the upland-rice plant and the "red-rice" plant. (pp. 59–60).*

Mixed sowings of the upland variety Norin 21 [Ministry of Agriculture and Forestry 21] and red rice demonstrated that the latter is at a considerable competitive advantage (cf. Abst. 243).

245 *Sakai, K. & Suzuki, Y. Theoretical considerations on random drift of allelic genes or chromosomes and decrease of heterotic vigor in allogamous plants. (pp. 60–62).*

Cf. *PBA*, XXV, Abst. 33.

246 *Kimura, M. "Stepping-stone" model of population. (pp. 62–63).*

A model of population structure is proposed in which the population is subdivided into many local subgroups within each of which random mating occurs, exchange of individuals between groups being limited to adjacent groups. The degree of genetic differentiation to be expected from random fixation of alleles in this model is considered.

247 *Kimura, M. Process leading to quasi-fixation of alleles due to random fluctuation of selective values. (pp. 63–65).*

Cf. *PBA*, XXV, Abst. 37.

248 *Kimura, M. On simultaneous distribution of gene frequencies in populations. (pp. 65–66).*

The problem of obtaining a comprehensive formula for the simultaneous distribution of gene frequencies when random fluctuations in selective values occur is considered. The approach is *via* extension of the Fokkar-Planck equation to a multivariate case.

Proceedings of the forty-first Indian Science Congress, Hyderabad (Deccan) 1954 : Pp. 84 + 226 + 330 + 310.

Part II. Presidential addresses.

249 *Pal, B. P. The improvement of wheat in India. (pp. 154–81).*

The author surveys the work carried out so far in India in the improvement of wheat varieties in respect of quality of grain, yield, disease resistance and other agronomic qualities, interspecific hybridization and improved cultural practices, and suggests some lines along which further advances might be made.

Part III. Abstracts.

250 *Joshi, N. C. Further studies on the red rot disease of sugar cane. (p. 124).*

Sources of infection of *Colletotrichum falcatum* have been investigated, and a number of varieties tested for resistance. Co.312, Co.557, Co.552, Co.213 and Co.331 are very susceptible, while Co.421, Co.513, Co.527, Co.313, Co.395 and Co.393 are resistant.

251 *Datta, M. Cytological studies on two species of* Morus. *(p. 145).*

The chromosome number of *M. laevigata* was found to be $2n = 56$, indicating that it is a tetraploid; all the seeds are fertile. The number $2n = 28$ was confirmed for *M. indica* with no varietal differences in meiotic behaviour. At diakinesis four large chromosomes form a quadrivalent, while the remaining smaller chromosomes normally form bivalents, although occasionally four will form one trivalent and one univalent. At first and second metaphase the chromosomes secondarily associate in seven groups.

252 *Sharma, A. K. & Bal, A. K. An investigation on the effect of certain chemicals on the nucleus and their possibilities in chromosome analysis. (pp. 147–48).*

The use of coumarin, esculin and salicin in chromosome analysis is described. Fragmentation has been observed with some concentrations of coumarin and salicin.

253 *Kar, B. K. & Mazumdar, S. K. Physiology of flowering in jute* (Corchorus). *(pp. 152–53).*

The flowering period in *C. capsularis* 'D154' extends over four weeks, with the maximum in the second week, whereas in Fanduk flowering continues for six weeks, with the maximum in the third and fourth weeks. In the case of *C. olitorius* both R26 and Chinsura Green flower for ten weeks, with several flushes during this period.

254 *Misra, G. Effect of short day length on early-winter rice. (pp. 153–54).*

Cf. Abst. 562.

255 *Misra, G. Effect of short photoperiod on late-winter rice. (p. 154).*

Ten-hour photoperiods for three to six weeks in the seed bed delay ear emergence in C3, SR26B, FR43B and FR13A, but when the treatment is continued after transplanting until ear emergence, a marked increase in earliness is noted.

256 *Misra, G. & Samantarai, B. Effect of short day on early rice.* (*p. 154*).

Eight-hour photoperiods from the age of 15 days until ear emergence cause a delay in flowering in B76, similar to that previously observed in T136, TN22, TN27, ch10, Charnock and Panbira.

257 *Sen, B. & Verma, G. Studies on the pollen grains of crop plants: Maize* (Zea mays) *I.* (*pp. 156–57*).

A suitable germinating medium for maize pollen grains was found to be a 12·5% sucrose solution containing 0·5% to 1·0% agar, the concentration of agar varying with different strains of maize. The addition of 2 p.p.m. of colchicine induced better germination and greater elongation of the pollen tubes.

258 *Rajan, S. S. Studies in polyploidy breeding. Part I. The effectiveness of the mass pedigree system of selection in the improvement of seed setting in colchicine-induced autotetraploids of toria.* (*p. 250*).

An increase in seed setting in *Brassica campestris* var. *toria* is reported when a mass pedigree system of selection is employed. A twice selected population gave a high frequency of highly fertile tetraploids; a once selected population gave a slightly lower frequency, which was still significantly greater than that of an unselected population.

259 *Bhaduri, P. N. & Ghosh, P. N. Chromosomal biotypes in Emmer wheat,* (*p. 250*).

Two distinct races have been found in *Triticum dicoccum* var. *farrum,* differing in length of ear, pollen size and fertility and grain size and setting. They differ also in possessing one or two pairs of SAT chromosomes and breed true for this character. The presence of these two races is thought to account for differences in fertility and grain setting reported for hybrids between *T. dicoccum* and *T. vulgare.*

Part IV. Late abstracts.

260 *Sharma, A. K. & Bhattacharyya, N. K. A study of spontaneous chromosome fragmentation in* Vicia sativa *Linn.* (*p. 25*).

Numbers of fragments up to four were found at all stages of mitosis, with no difference between seeds germinated with and without soaking. Degeneration of fragments with increase in age, occurrence of micronuclei, and the possibility that secondary constriction regions are involved in the breakage are mentioned.

Discussions.

261 *Plant viruses.* (*pp. 86–91*).

Among the topics discussed were (1) the production of disease-free seed potatoes in India, (2) insect transmission of virus diseases, (3) breeding for virus resistance with special reference to interspecific hybridization, (4) the effect of cultural and environmental conditions on the development of disease symptoms and (5) the possibility of developing a quarantine system for imported plant material.

262 *Biological effects of radiation.* (*pp. 91–95*).

P. Nandi described the production of mutant strains of *Streptomyces* spp. and *Penicillium notatum* by ultraviolet irradiation. Thirty-seven mutants of *Streptomyces* were produced, of which ten gave a higher antibiotic yield than the parent strain. Four of the *Penicillium* mutants gave a higher antibiotic yield and remained stable for nine generations. B. C. Kundu and G. I. Patel outlined the results of treatment of *Corchorus capsularis* and *C. olitorius* with various dosages of X rays. Cytological effects included different degrees of pairing at diakinesis, fragmentation, formation of one or two quadrivalents and failure of spindle formation. The pollen grains showed 96% sterility due to irregular meiosis.

263 *Genetics in relation to crop production.* (*pp. 120–35*).

Examples were discussed of the direct application of genetical principles to the improvement of crop production, i.e. the use of hybrid vigour, male sterility, induced polyploids and induced mutations in the development of higher yielding varieties possessing greater disease resistance. Particular reference was made to maize, cotton and sugar cane.

264 *Crop physiology and crop production.* (*pp. 135–46*).

R. D. Asana described a series of experiments with three varieties of wheat, Punjab C228, Kendee and NP710, which indicated that varietal differences remained fairly constant under different cultural treatments. B. K. Dar gave an account of varietal differences in jute, with special reference to various aspects of growth and development.

265 **What's new in farming.**
Indian Fmg. 1956 : **6** : No. 2 : p. 21.

Sorghum. The newly introduced variety Coimbatore 12 has given outstanding yields in Madras; its maturation period is 85 days.

Linseed. In trials in the Punjab, the yields of K–2 have been almost twice as great as those of local varieties. In addition, its oil content is 7·1% higher, it matures about 10 days earlier and it is highly resistant to rust and wilt.

266 **Annual Administration Report of Agriculture and Animal Husbandry Departments, U.P. College of Veterinary Science, Mechanised State Farm and Agricultural Engineering Department, for 1951-52 ending June 30, 1952** (1955) : Pp. 213.

Rice. Promising hybrids between Chinese varieties and N22 are being multiplied. Crosses between Russian and local varieties were studied with respect to earliness. New crosses were effected between Japanese and local types to obtain selections combining (1) earliness, abundant tillering and stiff straw, and (2) high yielding capacity and short duration.

Other crops. Improvement of cereals, pulses, oil species, sugar cane and other crops by selection continued. Hybridization of wheat, barley, potato, linseed, cotton and table pea is mentioned.

267 Rapport du Conseil de l'Expérimentation et des Recherches Agronomiques pour 1954. (**Report of the Council for Agronomic Experimentation and Research for 1954**), Alger 1955 : Pp. 262.

In addition to the crops listed below, the results of variety trials of beans, peas, lentils, tobacco, rice, potato, various leguminous and non-leguminous forage plants, figs, olives, citrus fruits and avocado are presented. The trials were carried out at Maison-Carrée, Ferme Blanche, Orléansville, Sétif and a number of other experimental stations in Algeria.

Cereals. Data on yield and 1000-grain weight are presented for the principal varieties of hard and soft wheats grown in Algeria. The early-maturing hard wheats Zénati x Bouteille 20780 [Bottle 20780] and Palestinien 21150 [Palestinian 21150] gave the highest yields at Maison-Carrée. The new midearly hybrid Syndiouk Mahmoudi x Zénati Bouteille 22738 also gave good yields and was distinguished by its high degree of resistance to black rust and by the quality of its grain. Kalèche 19948 did well and proved resistant to frosts. Under irrigated conditions at Ferme Blanche, Zénati x Bouteille 16584 and Palestinien 20606 proved highly productive. Of the soft wheats tested, Pusa Mentana 9340 and Pusa Mentana 9290 gave the highest yields; the double hybrid (Pusa x Mentana) x (Florence x Aurore [Dawn]) gave good yields of grain with excellent technological properties. Other varieties that did well were Étoile de Choisy [Choisy Star], Aegylops 14257 and Florence x Aurore 8193. Of the oat varieties tested, Palestine and 31 proved highly productive. The barley varieties Martin 839, Tichedrett 3270, Tichedrett 3265 and Condorcet 3577 were superior. Of the American maize hybrids tested, Kansas 1859 did best, followed by Texas 26 and Texas 30.

Cotton. Acala 4–42 gave good results in variety trials. Selection is being carried out on a number of varieties introduced from California and Egypt.

Sugar beet. Maribo P gave the highest yields of sugar per ha. in variety trials; Kleinwanzleben E and Hilleshög E7388 also gave good results.

268 **Annual Report of the Secretary for Agriculture of the Department of Agriculture of the Union of South Africa, for the year ended 31st August, 1955.**
Fmg. in S. Afr. 1956 : **31** : 40–175.

In addition to the work described below, breeding work and varietal trials involving cereals, lucerne, strawberry, grape, pineapple, peas and beans and other crops are briefly reported.

Maize. In breeding for streak resistance, top crosses of inbred lines with streak-resistant P x H are promising. Because of their lack of luxuriant growth and of adaptability, white double hydrids have proved less satisfactory than the top crosses PP x K64 and AWF x K64. Widely adapted South African lines highly resistant to leaf blight and having well-filled shining kernels are now being used in the breeding programme. Progress has been made in producing yellow hybrids, in using male-sterile plants in the production of hybrid seed and in breeding sweet corn and popcorn hybrids. Yellow lines bred in Natal appear to give high-yielding top crosses with Sahara and Teko Yellow.

Grasses. The work of the Division of Crops and Pastures on the breeding and selection of *Digitaria*, *Setaria*, *Eragrostis* and *Ehrharta* continued, special attention being given to the production of a runner type of *Digitaria smutsii* with good seeding capacity. In the Natal region, a grass-breeding programme has been begun and initial populations of *Paspalum dilatatum*, *Eragrostis curvula* and *C. gyana** have been established with a view to conducting progeny tests at a later date. *Pennisetum typhoides* x *P. purpureum* and *P. typhoides* x *P. sphacelatum* have been treated with colchicine.

---

* *Chloris gayana?*

Potato. Pentland Ace, carrying the gene *R*3 for blight resistance, has been severely attacked in parts of the Southern Cape, a region in which race 3 of *Phytophthora infestans* has been identified. Breeding for virus resistance continued.

Sweet potato. Seedling 4–95 has again proved outstanding and is shortly to be named and released.

Apple. Reciprocal incompatibility between Granny Smith and Ohenimuri results from inhibition of pollen tube growth in the stylar tissue. Hybrid 3/2 has shown promise. One tetraploid ($2n = 68$) has been established.

Plum. Crossing and selfing has continued, varieties showing most resistance to the drying-off disease being used as parents. Crosses with European plums are being made with the object of developing improved prune varieties.

Peach. Attempts are being made to combine the earliness of Early Dawn with the good canning qualities of the Kakamas types.

Citrus fruits. Consistent yield differences between strains have been observed among 13 late-maturing Valencia oranges, three of the strains giving exceptionally high yields. Numerous intraspecific crosses have been effected, as well as crosses with trifoliate orange.

Guava. Twenty-four promising hybrids have been selected. The breeding of triploid types ($2n = 33$) with the aim of reducing the number of seeds per fruit is continuing.

Papaya. Selfing to obtain lines with improved yield, fruit quality and disease resistance continued, the ultimate aim being the production of F_1 hybrids.

Avocado. Nearly all varieties tested were self pollinating, but Collinson and Hamaboya produced no viable pollen.

Onion. Selection and inbreeding continued in the varieties Early Cape Flat, De Wildt, Texas Grano, Hojem, San Joaquin and a few promising imported varieties. Cytoplasmic male sterility, found in the varieties Laat Geel [Late Yellow], Cape Straw, Caledon Globe, Ailsa Craig, De Wildt, Early Cape Flat and Australian Brown, is to be utilized in the production of hybrid seed.

Cabbage. A few promising selections with exceptional resistance to stem rot have been obtained. With a view to exploiting heterosis in Cape Spitz, the combining capacity of a number of self-sterile lines with established inbreds is being determined.

Cucurbits. Productive, early-maturing pumpkins with good keeping qualities have been selected from the variety Flat White Boer. Pollination experiments showed that moisture content and fruit setting are correlated and are inversely proportional to temperature, temperatures above 82° F. being unfavourable to fruit setting. Bitterness in cucumbers and gem squashes appears to be determined by a single dominant factor.

Tomato. Selections from promising crosses have been made. The breeding value of male-sterile plants found in the varieties Pearson and Doublerich is being studied. Among 14 varieties and 4 new hybrids, the long-fruited hybrid Coopersdal 9 x San Marzano, which is particularly suitable for processing, outyielded Coopersdal 6, the best commercial variety. Most of the hybrids gave high yields but produced too high a percentage of unmarketable fruit. Attempts are being made to combine resistance to *Fusarium* wilt with improved resistance to blight. Eelworm-resistant segregates have been isolated from *Lycopersicon esculentum* x *L. peruvianum* and attempts to obtain eelworm-resistant material of more desirable genotype are in progress. Some F_1 hybrids have yielded well and matured more rapidly than the earlier parent.

Cowpea. Investigations on the inheritance of a lethal condition, of mottled pod and of green-seamed purple pod have been made.

269 **Annual Report of the Department of Agriculture, Nyasaland Protectorate, for the year 1954/55** (1956) : Pt. II : Pp. 75.

Annual Report of the Department of Agriculture, Nyasaland Protectorate, for 1955 (1956) : Pt. I : Pp. 32.

Reports are given of trials of varieties of wheat, sorghum, rice, cotton, cassava, tobacco, tung, sunflower, peaches, groundnuts, strawberries, beans, cowpeas and soya beans.

Maize. Extensive breeding programmes and variety trials have continued. Data are provided on yield of grain, percentage establishment, percentage lodging and other characters of thirteen varieties and hybrids grown at five localities. The importance of regional adaptation was demonstrated.

Sweet potato. Eight varieties were tried for the second year in succession. Mkokabwato, Malamulo and Kamciputo are recommended.

270 **The first five years at the Sabi Valley Experiment Station.**
Rhod. agric. J. 1956 : **53** : 285–327; 335–96.

The above station was established to implement the Sabi irrigation project in Southern Rhodesia. Its initial activities have included the following breeding and testing:—

Wheat. Introduced varieties and selections of local material have been tested. In the 1955 trials, Regent appeared to be immune to both stem and leaf rust, although poorly adapted. If further tests show it to be immune, the variety should however prove useful in breeding for resistance. Burbank is the only wheat so far found which combines good adaptation and a high degree of resistance to lodging; it is recommended for cultivation until a more satisfactory variety is available.

Maize. White hybrids from Salisbury have in general proved to be poorly adapted and susceptible to diseases, the best being (N3 x A5) x (T4 x M9). Among the open-pollinated varieties tested, Krug Yellow Dent and Sahara have shown promise and have been inbred with a view to hybrid production.

The experimental hybrids already developed include material practically immune from virus streak and resistant to *Helminthosporium* leaf blight; they are however susceptible to rust. The rust resistance discovered in a strain in the collection recently grown is to be transferred to the best inbreds developed at the station. Under the conditions of the Sabi valley three generations of breeding material can be raised in a single year.

Cotton. Trials of selections from the Gatooma Research Station are in progress. Promising yields have been secured.

271 Experimental farm highlights in the Atlantic provinces 1955.

Canad. Dep. Agric. 1955 : Pp. 21.

Variety trials are reported of oats, lucerne, potatoes, raspberries, squashes, field beans and tomatoes. A new apple seedling, 27–32–52, is recommended, and a new tetraploid rye for pasture purposes is undergoing trials. The potato breeding programme is briefly described. Seedling 1711–9, one of the progeny of Hindenburg x Sebago, is very promising, showing high yield, good scab resistance and high dry matter content.

272 Progress Report of the Experimental Farm, Harrow, Ontario 1947-1954 (1956) : Pp. 51.

A review is given of progress made during the last eight years in the development of varieties of winter wheat, oats, maize, tobacco, sunflower, peaches, melons, tomatoes and soya beans.

273 Annual Report of the Department of Agriculture, Ottawa, Canada, 1954-1955 (1956) : Pp. 56.

In addition to the crops listed below, trials have been carried out of red clover, flax, tobacco, rape, safflower, tomatoes, beans and peas.

Chromosome counts. It has been shown that the rusts *Puccinia malvacearum*, *P. asteris* and *P. xanthii* have eight chromosomes.

Cereals. A study has been made of the physiological causes of sterility and those arising as a result of interspecific hybridization, and a preliminary investigation begun into the causes of asynapis in cereal chromosomes.

Wheat. Progress has been made in breeding strains of spring wheat resistant to leaf and stem rusts, and soft winter wheat resistant to dwarf bunt. Two rust resistant durum strains, DT 136 and 137, show good macaroni quality.

Buckwheat. It has been found that when mixtures of lines are grown there may be an increase in size of seed and yield per acre, and trials are to be made to test the combining ability of the best-yielding strains.

Oats. Intensive breeding programmes designed to produce disease-resistant strains by interspecific hybridization, and strains with improved agronomic qualities for the different regions of Canada, have made good progress.

Barley. Two new varieties of forage barley, Vantmore and Wolfe, were licensed during the year. Variety and breeding trials continue and success has been achieved in crossing *Hordeum leporinum* with *H. vulgare*. Barley-like segregates with a winter habit of growth and resistance to certain diseases were obtained, which were then crossed and back crossed with cultivated barley. The results of these crosses are undergoing further trial. Investigations have been begun on the genetic control of smut resistance.

Flax. In the course of breeding for resistance to *Sphaerella linorum*, an interspecific hybridization programme has been started. So far only hybridization between species with the same chromosome number has been successful.

Apple. Six recent selections show promising qualities. M–366, from Moscow Pear x Melba, has shown no external evidence of winter injury for 17 years, and produces a good dessert apple. M–367, from Tetofsky x Patricia, produces apples less well coloured but of better flavour than M–366. M–368, from Trail x McIntosh, is hardy and productive, giving small but good quality apples for dessert or cooking. M–369, an open pollinated seedling of Anisim, has similar qualities to M–368 but the fruit is larger. All these selections are autumn and early winter apples. O–342, from Crimson Beauty x Melba, ripens at the same time as Crimson Beauty but is of superior quality. T–441, from Crimson Beauty x Red Melba (Pate strain) is of good appearance and quality, and also ripens at the same time as Crimson Beauty.

Strawberry. Three new selections appear promising. Agassiz 53, from Pathfinder x British Sovereign, yields better than British Sovereign, producing bright red, large, firm fruits, of uniform size, with a slightly acid flavour and high freezing quality. The plant is vigorous and has some resistance to drought and *Phytophthora fragariae*. F487 and 489, both from Sparkle x Valentine, yield well and have been free from leaf spot, *Mycosphaerella fragariae*.

Rhubarb. Considerable differences have been found in the acid contents of six varieties, with Sutton's Seedless consistently highest, in spite of seasonal fluctuations associated with rainfall and with time of harvesting.

Annual meeting and convention, the Agricultural Institute of Canada, University of Toronto, June 25th-June 28th.

Agric. Inst. Rev. 1956 : **11** : No. 3 : 31–46.

The abstracts of papers to be read at the 1956 meeting of the institute include a number on breeding and genetics:—

274 *Kerr, E. A., Dickson, G. H. & Willison, R. S. The nature of certain leaf abnormalities in sweet cherry.* (*p. 35*).

Evidence has been obtained indicating that albinism and leaf crinkling in Hedelfinger and of mottling in Black Tartarian are genetically determined (cf. Abst. 808).

275 *Adamson, R. M. Utilization of self-incompatibility in breeding cabbage of Golden Acre type.* (*p. 35*).

The cabbage Golden Acre is predominantly self fertile. Intercrossing of plants homozygous for self incompatibility revealed the occurrence of three incompatibility groups, each of which is reciprocally cross fertile with the other two. Several hybrids between lines from different breeding groups have shown desirable characteristics, notably extreme earliness and a high degree of uniformity. Whether suitable hybrids can be produced under field conditions remains to be determined.

276 *Walkof, C. W. Selecting large fruit size and early maturity in determinate tomato crosses.* (*p. 36*).

Further work on the best method of obtaining large-fruited early selections from crosses of the early small-fruited variety Farthest North with later large-fruited varieties such as Early Jersey has suggested the desirability of selecting simultaneously for large fruit size and earliness only in back crosses in which Farthest North does not recur (cf. *PBA*, XXVI, Abst. 764).

277 *Mittleholzer, A. S. An evaluation of certain agronomic characteristics of tetraploid Dollard red clover.* (*p. 37*).

Tetraploid plants differed significantly from the diploids in that they flowered earlier, had a lower number of nodes, shorter stems, lower leaf index, thicker leaves and lower seed and forage yields. The diploids had a significantly higher number of florets per head. Selection and the study of fertility are necessary for the production of improved 4*n* lines.

278 *Bubar, J. S. Flower colour inheritance studies in broadleaf birdsfoot trefoil* (Lotus corniculatus *L.* (*p. 37*).

Light-yellow flower colour proved to be tetrasomically inherited, light yellow being completely recessive to orange. Inheritance of red *vs.* yellow keel tip was more complex.

279 *Zillinsky, F. J. New developments in interspecific oat hybridization of importance to plant breeders.* (*p. 40*).

Polyploids may be synthesized from diploid species of *Avena* by (1) induction of autotetraploids by colchicine treatment, (2) crossing 4*n* x 2*n* species and selecting the most fertile tetraploids in the progenies obtained by selfing for several generations and (3) doubling the chromosome number of F_1 hybrids of 4*n* x 2*n* crosses. Methods of introducing the desirable genes of other species into *A. sativa* are discussed. Partial self fertility may be obtained immediately by doubling the chromosome complement of the 4*n* x 6*n* hybrids and back crossing to *A. sativa*. Complete fertility was obtained in the fourth back cross of the amphidiploid ($2n = 70$) of *A. abyssinica* x *A. sativa* to *A. sativa*.

280 **Director's Annual Report of the Mexican Agricultural Program, September 1, 1954-August 31, 1955,** Rockefeller Found., NY : Pp. 145. (Mimeographed).

In addition to the crops mentioned below, the results of trials of onions, carrots, broccoli, Swiss chard and lettuce are reported.

Wheat. It has been found that mature plants of Chapingo 52 and 53, Mexe 53, Bajío 53 and Toluca 53 possess adequate field resistance to all races of stem rust prevalent in Mexico, although in the seedling stage under greenhouse conditions they are susceptible to races 29 and 48. These varieties have now been distributed on a commercial basis. Lerma Rojo [Red Lerma] and Kentana 54, carrying resistance to stem and stripe rusts, are being developed for use at high altitudes in regions where these diseases are prevalent.

Maize. The results are given of trials of varieties and hybrids at altitudes of 0–1000 m., 1400–1900 m. and 2000–2600 m. At high altitudes without irrigation, H–124 yielded well, but matured late; with irrigation H–1 and H–4 were both promising. At intermediate altitudes H–352 was outstanding when planted early but H–309 was better for later plantings. The new experimental hybrid H–3509 outyielded both of these with or without irrigation. At the lowest altitudes H–503 and H–501 were generally superior but were outyielded by H–502 in drier areas. A total of 1454 collections from Mexico and Central America have been planted with a view to testing them as a source of germ plasm for breeding work.

Breeding for resistance to *Helminthosporium sativum* has continued.

Sorghum. In the altitude range 1400–1900 m., Kafir–1 outyielded all other varieties. At lower altitudes, with limited rainfall, the best varieties were Shallu, Martin Combine, Redbine–3, Caprock and Early Hegari. 123 varieties from the United States Department of Agriculture were tested at Papaloapan. Some were of value for forage production and will undergo further trials.

Lucerne. Trials indicate that varieties giving high yields in their first year do not always give equally good stands in succeeding years. Apaseo, Valenciana, Caliverde, Ranger and Kansas Common appeared promising in this respect.

Potato. In trials at two localities Up-to-Date and Alpha yielded well in both trials. Other good varieties at León were Erdgold [Earthgold], Furore and Kennebec, and at Chapingo, Profijt [Profit], Ackersegen, Majestic, Pontiac, White Rose and Alemana 3 [German 3].

The purple-top disease has been transmitted from potatoes to tomatoes and back by grafting. Tuber transmission in potatoes appears to carry through one generation only, since no symptoms were observed in plants grown from second generation tubers.

Plants from Europe and North America were selected for resistance to *Phytophthora* and breeding for resistance has also been carried out. 12 races of the fungus have been identified in Mexico.

Asparagus. VC309 is the most promising of the varieties under trial at present.

Cabbage. Glory of Enkhuizen continued to give higher yields, and higher average head size than any other varieties. Green Acre and Resistant Detroit are also satisfactory.

Squash. Caserta has proved outstanding in trials at four localities, suffering little from wind damage and remaining free from disease and insects.

Cucumber. Crosses have been made between Hodai, which is well adapted to conditions at Cotaxtla but produces poor fruit, and eleven other varieties possessing various desirable characteristics.

Tomato. Breeding for resistance to virus diseases and *Phytophthora infestans* has continued. Some resistance has been found among *Lycopersicon* species occurring wild in Mexico, and these have been crossed with commercial varieties. The hybrid lines thus developed possess considerable resistance to both virus diseases and *Phytophthora*, but at present produce rather small fruits.

Data are provided of the yields of a number of varieties and hybrid lines. S–1 was outstanding, and is released as Cotaxtla 1. It yields well, is vigorous and the fruits are resistant to sun scald. SR–9 S–31 pl20J is also very prolific, and both these lines recover well from wind damage. Step 197 and 193 and Long Red are recommended.

Bean. Selections have been made from F_7 and F_6 lines which will be further selected in trials for yield and disease resistance. Several have already been found to yield up to 50% more than the standard variety Canario 101 [Canary 101], and to have increased disease resistance.

Sixteen races of bean rust have been identified, and four new races of *Colletotrichum lindemuthianum*, one of which will attack Canario, previously thought to be immune.

A programme of breeding for resistance to *Thielavia basicola* has been begun, by crossing *Phaseolus vulgaris* with *Ph. coccineus*, which is highly resistant. The F_1 plants are self sterile, but when back crossed with *Ph. vulgaris* give offspring which are self fertile, and resemble *Ph. vulgaris* but retain the resistance character. The classification of beans in Mexico has been completed.

Trials were made of 80 varieties of snap bean, of which ten were outstanding for disease resistance and other characters. Data on yield, days to maturity, pod shape and quality of these ten varieties are provided.

Lima bean. Henderson Bush Lima and Fordhook 242 of the bush varieties, and King of the Garden and Calico Pole of the intermediate type are recommended.

Vigna sinensis. Chinegra, Purple Hull and Blackeye Crowder continue to do well. All varieties suffer less from insect and disease damage than do field beans.

Pea. Data are provided on yield of pod and shelled peas, days to harvest and quality of 22 varieties. Pride gave the highest yield, but was not of good quality. In studies of pea seed rot the varieties Alaska, Yudon and Shasta showed the greatest resistance. In all cases resistance was less when seed was planted after the rains had begun.

281 Informe anual del Instituto Interamericano de Ciencias Agrícolas de la O.E.A. 1953. (**Annual report of the Interamerican Institute of Agricultural Sciences of the OEA, 1953**).
Turrialba, Costa Rica 1953 : Pp. 259. (Mimeographed).

The work reported, in addition to that mentioned below, includes variety tests with potatoes, sweet potatoes, peas, Lima bean and sugar cane.

Maize. A number of crosses have been made of the lines showing the best combining ability. The method of crossing consanguineous lines did not give good results.

Coffee. The collection now comprises 204 types, including some mutants resistant to wind and low temperatures. Some forms have displayed resistance to *Geococcus coffeae* and *Neorhizococcus coffeae*.

Cacao. Selection for resistance to *Phytophthora palmivora* and high yield is being performed on a number of seedling populations.

Vegetables. The tomato Turrialba 2 is a selection with improved size of fruit. The sweet pepper Milfruto is giving excellent results in various countries, as is the French bean Rico [Rich].

282 Memoria. El MAI contribuyó al desarrollo agrícola industrial en 1955. (**Report. The Ministry of Agriculture and Industries contributed to the development of agricultural industry in 1955**).
San José, Costa Rica 1956 : Pp. 100.

The breeding work in Costa Rica reported on includes selection of several species of forage plants and variety tests with rice, potato and other crops, in addition to the activities referred to below.

Oats. The results include selections 165 and 186 which are distinguished by high yield of grain and resistance to lodging and shedding.

Maize. Yield increases of up to 94% were obtained in different parts of the country by the use of hybrids such as ETO, Blanco 1–451 [White 1–451], Rocal H–251 and Colombia 2 among the white and H–203 and 1–452 among the yellow.

Coffee. The work reported includes selection for improved yield and observations of Tico and other hybrids.

Sugar cane. Observations on a number of hybrids have shown Co.419 and Pindar to be suitable for growing on very poor soils. Other hybrids that have done well are B37–161, POJ30–16, B43–62 and H37–1933.

283 **Investigations 1954.**
Bull. Dep. Agric. Jamaica 1955 : No. 54 : Pp. 130.

Banana. Breeding work on Gros Michel continued. Six new seedlings showed resistance to Panama disease and are to be subjected to field trial. Compared with Lacatan, variety 1877 has proved to be lower yielding, more resistant to *Cercospora* leaf spot and later in fruiting; it is not regarded as a suitable subsitute for Lacatan.

Cashew. Selections were further studied with respect to flower and nut production.

Other crops. Variety trials were carried out on rice, cassava, cacao and pigeon pea.

284 **Experiment station reports.**
Sth. Seedsman 1956 : **19** : No. 8 : 53–55.

Brief accounts of the following new varieties are included:—

Wheat. Crockett, a hard red winter wheat developed at Texas Experiment Station, is characterized by early maturity, high test weight, large yields, high quality and greater resistance to rusts than most other hard red winter wheats. It resembles Wichita in appearance.

Cotton. Blightmaster, a high-yielding cotton tolerant of bacterial blight and having stormproof bolls and short branches rendering it adapted to the stripper type of harvester, has been introduced by the Lubbock Substation of the Texas Experiment Station.

Cowpea. The blackeye variety Grant has been referred to in *PBA*, XXVI, Abst. 3926.

285 **The progress of research in serving agriculture. Sixty-sixth Annual Report of the University of Maryland Agricultural Experiment Station, 1952-1953** (1954) : Bull. No. A–78 : Pp. 96.

Trials were carried out of barley, red clover, potatoes, broccoli, cantaloupes, beans, peas and sweet corn.

Wheat. In comparison with three older varieties the selection USDA2381, from a cross between Leapland and Fronteira, has yielded slightly better over a 5-year trial period. It is more consistent in yield, as it is resistant to leaf rust.

Rye. A German variety, Laube's cover crop rye, gave higher grain yields but lower straw yields than Abruzzi.

Maize. The hybrids Conn. 870, Pa. 602, Ohio W64 and US578 have again yielded well.

Forage grasses. Achenbach was the highest yielding of the smooth bromegrasses, Rowan and Climax of *Lespedeza*, and Commercial and Early Synthetic of the cocksfoot varieties. Trials have also been made of the polycross progenies of 89 cocksfoot clones.

Lucerne. Williamsburg is recommended for high yield and persistence, but Narraganset shows promise on poorly drained fields and can withstand competition from weeds.

White clover. A Beltsville strain of Ladino clover, known as FC23608, has been superior in general yield tests. This strain is included with sixteen others in a polycross seed programme.

Sweet potato. Two new varieties, Sunnyside and Oklahoma 46, were released for Maryland during the year (cf. *PBA*, XXIII, Absts. 2811 and 2815).

Tobacco. Posey, Wilson and Keller have given the best yields in a three-year trial under disease-free conditions, but are not disease resistant. Catterton is the highest yielding of the *Thielaviopsis*-resistant varieties, and Robinson of the *Fusarium*-resistant, with 88% and 92% respectively of the yield of the other strains. A new strain, RWM16, not yet released, is resistant to both these fungi and to *Pseudomonas tabaci* and mosaic, and has a yield of 96% of the best varieties. The nicotine content of these varieties, expressed as a percentage of the total alkaloids, is Posey 2·28%, Wilson 2·71%, Keller 2·36%, Catterton 1·61%, Robinson 1·58% and RWM16 1·42%.

***Capsicum*.** Field tests have begun of some of the thirty homozygous lines obtained by colchicine-induced doubling of the chromosomes of maternal haploid plants.

Strawberry. Several strains have now been produced which yield well and are resistant to *Mycosphaerella fragariae*, *Marssonina fragariae*, and *Sphaerotheca humuli*. Md-USDA2159 is also resistant to all strains of *Phytophthora fragariae*, although the degree of resistance varies.

Cantaloupe. Hearts of Gold and Purdue 44 are recommended for early planting, and Pride of Wisconsin and Queen of Colorado for later planting.

Soya bean. After trials on two types of soil in the Eastern Shore Area, the following varieties are recommended: short season, Lincoln and Adams; medium season, Perry, Wabash, Chief and Patoka; and long season, Dorman, Dortchsoy 67, S–100 and Luthy.

286 **Advancing agricultural horizons through research. Sixty-seventh Annual Report of the University of Maryland Agricultural Experiment Station, 1953-1954** (1955) : Bull. No. A–81 : Pp. 82.

Wheat. A cross between Leapland and Fronteira, previously known as Md-USDA 2381, has been released under the name of Tayland. It is superior to currently grown varieties, especially in its resistance to a number of leaf diseases. Five varieties were tested at several levels of fertilizer application. Atlas 50 responded better than the others to the higher levels, but in no case was a profitable increase recorded, and all varieties showed an increase in lodging at high nitrogen levels.

Oats. A new winter oat variety, Arlington, has given yields as good as those of Lee for the last four years, and is being recommended for use in Maryland. The spring oat varieties Clinton 59, Andrew and Mindo have yielded well in three-year trials.

Rye. The results of a fourteen-year programme of trials show that the southern varieties Abruzzi and Balbo consistently gave higher grain yields than northern varieties such as Rosen, Imperial and Cornell 76, although straw yields showed little varietal difference. Grain quality was in all cases poor, but improved quality is expected from two recently introduced German varieties, Tetra Petkus and Pumker's

Maize. Rates of planting of 22,000 plants per acre were found to be too thick for maximum yields of all the hybrids under trial. The greatest reduction in yield, compared with planting at 11,000 plants per acre, was shown by Conn. 870, US 505 and US 13, while only slight reduction was shown by Ohio K24, Pa.602 and Ohio W64.

Barley. In two-year trials Kenbar and Hudson have given better yield and grain quality than Wong, the variety usually grown in Maryland.

Dactylis. Breeding work has continued with a view to selecting late maturing strains for use with lucerne for hay. The better strains are now undergoing trials with varieties of lucerne. Beltsville continues to be the best of the varieties tested.

Bermuda grass. Coastal has been found to be more vigorous but less winter hardy than Midland under Maryland conditions.

Bromus. Achenbach and Fischer are the most satisfactory of the smooth brome grasses.

Lucerne. Williamsburg and Narraganset continue to be superior to other varieties tested.

Clover. Ten lines of red clover selected for vigour and anthracnose resistance are undergoing trials at a number of localities in Maryland. Kenland and Pennscott were the best of the established varieties. Clones of Ladino clover were obtained from pasture fields where Ladino has been maintained for several years. Those which are superior in yield and persistence will be used in the breeding of new varieties. In trials at 7 localities Pilgrim was the most satisfactory.

Lespedeza. Climax is the most productive variety on the eastern shore of Maryland.

Potato. A number of varieties were tested under conditions of heavy early-blight infection. In early season plots sprayed with a fungicide, Pungo, LaSota and Marygold outyielded Irish Cobbler. Without fungicide only LaSota was satisfactory. In late season plots without fungicide Kennebec, Marygold, Sebago, Katahdin, Pontiac and Pungo all outyielded Irish Cobbler while with fungicide only Kennebec significantly outyielded Irish Cobbler. Two of the unnamed seedlings, B606–67 and B355–44, also yielded well, the latter especially showing greater early-blight resistance than any other varieties or seedlings in the trial.

Sweet potato. When tested with strains of *Ceratostomella fimbriata* from Maryland and Louisiana, Maryland Golden was found to be extremely susceptible, Oklahoma 46 susceptible, Shoreland slightly resistant and Sunnyside very resistant.

The variety Oklahoma 46 was renamed Nemagold (cf. *PBA*, XXIII, Abst. 2815).

In an investigation of storage behaviour, Sunnyside, Allgold, Porto Rico, Kandee and Goldrush kept well, Nemagold developed storage diseases and some shrinkage and Shoreland developed internal breakdown.

Tobacco. Four new lines have been selected which combine resistance to *Thielaviopsis basicola, Pseudomonas tabaci, Fusarium* and mosaic, and are equal or superior to Robinson and Wilson in leaf type, growth habit, colour, texture, aroma and alkaloid content. Three-year trials have been carried out with five commonly grown varieties. Posey, Wilson and Keller yield well, Catterton yields less but is resistant to *Thielaviopsis basicola* and produces good quality tobacco, Robinson is intermediate in yield but is resistant to *Fusarium.*

Strawberry. Breeding for resistance to *Phytophthora fragariae* and foliage diseases continued. Md-US 2159, which combines disease resistance with good market qualities, has been released under the name of Stelemaster.

Broccoli. In three-year trials, Waltham 29 and Early One gave high yields of side shoots in comparison with terminal heads, while Early Green Sprouting gave a high proportion of terminal heads. The latter variety is recommended for the fresh market, the other two for freezing.

Cantaloupe. The first stage of the breeding programme has been completed with the incorporation into two breeding lines of high sugar content, small cavity, hard shell, distinctive netting and resistance to defoliation.

Soya bean. Trials have shown that long season varieties, such as Ogden and Lee, must be planted very early if they are to give satisfactory yields, but that the yield from Perry is not influenced by the time of planting. The varieties Clark, Lincoln, Perry and Ogden were the most productive, and showed the greatest resistance to lodging under Maryland conditions.

Sweet Corn. Data are provided on the performance of sixteen varieties in the presence of *Xanthomonas stewarti.*

287 **Research: background for efficient agriculture. Sixty-eighth Annual Report, 1954-1955.**
Bull. Md. agric. Exp. Sta. 1956 : No. A–83 : Pp. 86.

Wheat. The new variety Seneca has given the greatest yield and best grain quality in trials at the Plant Research Farm. Tayland continues to give higher yields and to have greater straw strength than Leapland, one of its parents.

Oats. Arlington and Atlantic were superior to Lee and other winter-oat varieties. A spring oat, Missouri 0–205, tested for the first time, appeared promising.

Rye. Tetra Petkus has continued to give higher yields than Balbo and Abruzzi.

Barley. Kenbar continued to perform well in respect of yield, quality of grain and disease resistance.

***Pennisetum*.** An experimental hybrid of pearl millet, known as Hybrid 1, has given the highest yields in trials with other pearl-millet and Sudan-grass strains. It was leafier, and showed less disease damage and greater aftermath growth, than the other strains.

Sorghum. A study has been made of chromosomal associations in hybrids between *S. vulgare*, with 20 chromosomes, and *S. halepense* and *S. almum*, each with 40 chromosomes.

Cocksfoot. Several late-maturing strains have proved satisfactory for hay production when grown with lucerne.

Bermuda grass. The Coastal strain was faster growing and more productive than the Midland strain during the summer of 1954, but suffered severe winter damage, while Midland suffered little injury.

Lucerne. Williamsburg and Narragansett continue to show superiority over other varieties.

Clover. Many Ladino clover plants were killed by severe winter conditions during 1954–55, those which survived being mainly plants selected from old pastures in Maryland, and some plants which had been selected for tolerance of low light intensities and resistance to *Sclerotinia*, by the United States Regional Pasture Research Laboratory, Pennsylvania. Further selections from old pastures are being made.

Sweet potato. Three out of 125 varieties from the Caribbean area were found to possess considerable resistance to *Ceratostomella fimbriata*. In trials of established varieties, Shoreland and Redgold gave the highest yields; Vates Golden, Nemagold, Sunnyside and La.O–123 were earliest. Thirteen varieties showed less cracking than Maryland Golden.

Tobacco. A variety with combined resistance to mosaic, *Pseudomonas tabaci* and *Thielaviopsis basicola* and one with a high degree of resistance to *Phytophthora parasitica* var. *nicotianae* have been developed, and are to undergo field trials in various localities in Maryland. Two new varieties have now reached the third generation, both of which are resistant to *P. parasitica* var. *nicotianae* and *P. tabaci*. In addition one is resistant to *Th. basicola* and the other to *Fusarium*. Hybrids have been made between *Nicotiana sylvestris* and the Catterton and Robinson varieties of tobacco with a view to introducing anthracnose resistance.

***Capsicum*.** Trials under field conditions of 28 of the homozygous plants produced by colchicine treatment of haploid plants have continued.

Tomato. Only one variety, Step 197, exceeded Rutgers in total yield in 1954, but several yielded more than Rutgers during the period up to 1 September, including W–R Brookston, Queens, Stokescross 4 and Stokescross 5.

Snap bean. Kinggreen, Contender, Tenderlong 15, Bountiful, Sweetheart and B–2194–1–1 all gave higher yields in both spring and autumn planted trials than Tendergreen. Seminole was promising for spring planting.

Soya bean. Trials have shown that Dorman, Ogden and Lee must be planted as early as possible, if they are to mature before the first frost, but Clark, Wabash, Perry and S100 may be planted in June. These seven varieties all yielded better than others tested at the same time.

Sweet corn. Trials were carried out under conditions of heavy infection with *Xanthomonas stewarti*, and *Heliothis armigera*. The commonly grown hybrid Golden Cross Bantam was extensively damaged by wilt, and few hybrids showed less than 90% earworm infestation. An experimental hybrid from Indiana, 471–U6 x 81–1, bred especially for earworm resistance, had the lowest infestation. It has some undesirable characteristics but will be used to introduce resistance into other hybrids.

288 **64th and 65th Annual Reports of the Agricultural Experiment Station of the Alabama Polytechnic Institute January 1, 1953-December 31, 1954** (1956) : Pp. 77.

Maize. A new inbred variety, Ala. 3212, has yielded as much as North Carolina 27, and shows lodging resistance equal to that of Dixie 18, and in addition has some resistance to weevils. It has been developed from the inbred lines Ab2, Ab12, Ab8 and F44.

White clover. Under four different treatments involving irrigation, cutting and harvesting methods large nonflowering strains showed the greatest persistence.

Cotton. Resistance to *Fusarium* has been found to be controlled at two loci in *Gossypium barbadense*, which is almost immune, and at a single locus in *G. hirsutum*, in which *Fusarium* resistance is influenced by factors controlling root-knot nematode tolerance.

289 **68th Annual Report of the Mississippi Agricultural Experiment Station for the fiscal year ending June 30, 1955 :** Pp. 85.

Brief reports are given of variety trials of the following:—

Wheat, oats for grain and forage, rye, maize, barley, sorghum, rice, red and white clover, potatoes, sweet potatoes, cotton, sugar cane, bell peppers, apples, pears, peaches, strawberries, carrots, cabbages, spinach, lettuce, cucumbers, tomatoes, okra, snap and Lima beans, soya beans, peas, sweet corn and popcorn. Varieties found to give high yields, and otherwise well suited to Mississippi conditions, are listed.

Cotton. It has been found possible to transfer the glabrous leaf type of wild American cottons to commercial varieties now in use without serious loss in yield.

Pear. A number of Tennessee varieties and selections proved highly resistant to *Erwinia amylovora.*

Tomato. Progress has been made in breeding tomatoes resistant to *Fusarium* wilt.

290 **Research work on crops and soils.** Miss. Fm. Res. 1956 : **19** : No. 7 : 2–3.

Trials have been carried out with rye, grain sorghum, castor oil and sesame.

Wheat. The improvement of Chancellor, Taylor and Coastal in respect of resistance to rusts and *Erysiphe graminis* and shortness of straw has continued. Resistance to leaf rust in the seedling stage and shortness of straw have been produced in Anderson by atomic irradiation.

Maize. The new white hybrid, Dixie 55, is prolific and will be increased for commercial use.

Barley. Breeding for disease resistance and shortness of straw have continued. Two kinds of shortness of straw have been induced in Kenbar by atomic irradiation.

Cocksfoot. A line has been developed which is resistant to rusts; 13 lines are being inbred to obtain seed for further breeding.

Bermuda grass. Coastal continues to outyield other varieties under all conditions.

Ryegrass. Selections resistant to *Puccinia coronata* are undergoing a third cycle of selfing.

Dallis grass. One segregate of *Paspalum dilatatum* from a hybrid is immune to *Claviceps purpurea* and seven others are highly resistant.

Johnson grass. Only one self-fertile selection of *Sorghum halepense* has been found, but it is high-yielding and persistent.

Clover. A high yielding, reseeding selection of crimson clover is being increased for distribution, and a new strain of red clover has shown resistance to *Erysiphe polygoni.* The Louisiana 51 strain of white clover has proved especially satisfactory where seed production is required, but strains from the northern states, England and New Zealand do not do well.

Soya bean. Ogden, Lee, Roanoke and Jackson are recommended for the hill regions of Mississippi.

291 **Research in Agriculture. Annual Report for 1954-55 of the Agricultural Experiment Station, Louisiana.** 1956 : Pp. 280.

Rice. The early medium-grained variety Nato (cf. *PBA*, XXVI, Abst. 2390) and midseason long-grained variety Toro (cf. *PBA*, XXV, Abst. 2014) have been developed. Short-season long-grained selections are undergoing tests for yield and quality.

Paspalum dilatatum. Selection of clones from within strains previously isolated has resulted in additional improvements.

Clovers. Experimental clones of white clover are being maintained for use in the production of new synthetics. Breeding to develop red-clover strains more resistant to *Erysiphe polygoni* and other fungi continued.

Potato. The white-skinned seedling 91–258, an oblong russet type, shows promise (cf. *PBA*, XXVI, Abst. 2539). Another white-skinned seedling, 91–143 (B61–3 x Cherokee), is highly resistant to scab, with a high solids content, good cooking qualities and yielding ability equal to that of Katahdin or Sebago. Methods of pollination and pollen storage were further studied (cf. *PBA*, XXVI, Absts. 2576 and 2578).

Sweet potato. Breeding lines are available which, besides showing good skin and flesh colour and abundant production of flowers, possess resistance to at least one of the following diseases: *Fusarium* wilt, soil rot, black rot and internal cork. L1–13 and other new seedlings have shown promise in yield trials. Varieties and seedlings tested in south-western Louisiana exhibited highly significant differences in reaction to *Albugo ipomoeae-panduratae* (cf. *PBA*, XXVI, Abst. 3509).

Cotton. Stardel was released (cf. Abst. 701). Clevewilt 6 is more tolerant of root-knot nematode and more resistant to root rot due to secondary invasion of fungi than Deltapine 15. Data from the cross between the two varieties suggested that reaction to nematodes depends upon two or three genes, with tolerance partially dominant. Heritability of reaction to this pest was however low. Strain 1–11–11 and selections of Stoneville 20 x Deltapine 14–312 and of the F_3 back cross of this hybrid to the Deltapine parent remained free from infection after inoculation with races 1 and 2 of bacterial blight. Louisiana 3314, Auburn 56 x Deltapine 14–312 and Stoneville 2B–R were further selected for *Fusarium*-wilt resistance and other characters. Derivatives of Auburn 56 x Deltapine 14–312 were also selected for resistance to *Verticillium* wilt.

Sugar cane. CP48–103 and CP47–193 were released (cf. *PBA*, XXVI, Absts. 541–2).

Fruits. Pear breeding for resistance to fire blight is in progress.

Fig crosses were effected, the ♀ parents including Celeste, Swann Celeste, Hunt, Florentine, Green Ischia and Smyrna x Mission.

Strawberry seedlings were selected for resistance to *Diplocarpon earliana* and *Mycosphaerella fragariae*. Selections outyielding named varieties are under commercial test.

Peach, blueberry, blackberry and dewberry breeding is also receiving attention.

Onion. The chief aim of breeding is the elimination or reduction of the defects of splitting, bolting and segregation of colour shown by the well-adapted variety Creole.

Shallot. An attempt is being made to incorporate the pink-root and yellow-dwarf resistance of the Nebuka onion into the shallot. The highly sterile hybrids are now being back-crossed.

Broccoli. Broccoli-collard lines have been back-crossed to broccoli in the hope of developing hardier strains.

Water melon. A selection of Calhoun x Charleston Gray was promising with respect to resistance to anthracnose and *Fusarium* wilt, quality, yield and fruit size. The advanced selection L–1 (Calhoun Sweet x Black Diamond) is to be extensively tested.

Tomato. Breeding to produce high-yielding lines with red globe-shaped fruit and resistance to *Fusarium* wilt, *Stemphylium* leaf spot and fruit cracking continued.

Okra. Progress is reported in the development of selections with a dwarf habit and cut leaf, producing either short round dark-green pods for freezing or long pods of this type for the fresh market and canning. The suitability of some lines as producers of seed for the extraction of edible oil is under investigation.

Snap bean. Progress is being made in breeding bush varieties. Breeding of pole snap beans of two types is under way: a long flat bean for northern markets and a cylindrical straight green type for local consumption and canning in southern Louisiana.

Lima bean. Lines of bush and pole types from Fordhook x Sieva were selected.

Pea. The garden pea D–3–43–3–1 displayed superiority over Thomas Laxton in yield, percentage of dry matter, ascorbic acid content, total sugars, earliness and freezing quality.

In field-pea breeding at the North Louisiana Experiment Station, Calhoun, derivatives of Calhoun Crowder x Texas Cream 40 showed pod splitting and pericarp cracking in the autumn planting, although promising with respect to yield and earliness in the spring crop. A single-plant selection without these defects was however obtained.

Sweet corn. Inbreds are to be crossed with the tropical variety Pajimaca to evaluate combining ability with a view to producing a top-cross hybrid.

292 **Results of Research in 1954 by the Agricultural Experiment Station of the University of Kentucky. 67th Annual Report of the Director** : Pp. 111.

Cereals. The wheats CI13083 and CI13110 and barley CI9517 are being increased for possible release.

The experimental maize hybrid Ky1002 was the only hybrid giving the highest yield in more than one locality.

Red clover. Mass selection of Kenland continued (cf. *PBA*, XXI, Abst. 2741). Varieties are being subjected to successive cycles of selection for resistance to *Colletotrichum trifolii*. The necrotic and symptomless responses to bean-yellow mosaic virus shown by plants of Kenland were inherited.

Hemp. An attempt is being made to develop a monecious variety with greater uniformity of the fibre than diecious types.

Tobacco. Conversion of nicotine to nornicotine during air curing of burley tobacco is controlled by a single dominant gene; the amount of conversion may however be influenced by other genes. Lines of Ky16 were homozygous or heterozygous with respect to conversion; they also showed differences in content of total alkaloids. The alkaloid content of all selections in the breeding nursery was determined with a view to reducing the nicotine content of new burley varieties. It is expected that good-quality lines homozygous for black-shank resistance will be developed from *Nicotiana tabacum* x *N. longiflora* hybrids.

Strawberry. Promising selections are being developed.

Popcorn. The experimental hybrids P23156, P23163 and P23140 were significantly higher yielding than commercial hybrids.

293 **Research serves Colorado agriculture. Sixty-sixth Annual Report of the Colorado Agricultural Experiment Station for the fiscal year July 1, 1952 to June 30, 1953.** 1953 : Pp. 47.

Brief reports are given of trials of maize, sorghum, lucerne, potatoes, onions, seedless water melons, cucumbers, tomatoes, beans and sweet corn.

294 **Research points the way. 66th Annual Report of the New Mexico Agricultural Experiment Station 1954-1955.** 1956 : Pp. 75.

Variety trials have been carried out with wheat, oats, maize, barley, sorghum, potatoes, sweet potatoes, sweet peppers, castor oil plants, sunflowers, peaches, carrots, cabbages, cauliflowers, lettuces, cantaloupes, tomatoes and field beans.

Wheat. Nine races of *Puccinia rubigo-vera* var. *tritici* were isolated from diseased leaves collected in the area. The most frequently found was race 126, which made up 50% of the collections.

Lucerne. Breeding experiments have continued with a view to improving yield, quality and disease and insect tolerance. Variety trials in respect of these characters have also been carried out.

Cotton. A new strain selected from Acala 1517C has given good yields. It is similar to its parent strain, but has a slightly stronger and coarser fibre. Breeding for *Verticillium*-wilt tolerance and improved fibre qualities and yield has continued. Variety trials were also carried out. Seeds of three strains were exposed to thermal neutron bombardment and X irradiation. X irradiation produced a number of abnormal plants which will receive further study. Progress has been made in breeding strains resistant to both strains of bacterial blight, but these are not yet wholly satisfactory in other respects.

Kenaf. Seven strains were found to grow vigorously and one, PI203,425, gave a good seed yield. Most of the strains tested appeared promising for fibre production.

Sugar beet. Eight varieties and strains were tested for resistance to curly top, yield and weight per root.

Chilli. Progress has been made in developing earlier yielding and more pungent varieties, and others resistant to wilt. The new variety Rio Grande has proved popular with growers and processers.

Proboscidea. Species of this genus are being investigated as a possible crop plant for dry farming areas. Seeds were exposed to X-ray and thermal neutron radiation treatments, and selfed and open pollinated seeds were obtained from this material.

Pecan. Trials were carried out to find the varieties with the greatest resistance to foliage injury caused by the black pecan aphid.

Onion. An improved strain, S–1, of the White Grano onion has been developed and breeding work has continued to develop pollen-sterile lines and lines resistant to pink root, *Pyrenochaeta terrestris.*

Pinto bean. In trials at State College the variety UI111 was superior in yield and earliness. Breeding for disease resistance was carried out.

295 Al servicio de la agricultura en las Américas. Informe anual 1954–55. (**Service to agriculture in the Americas. Annual report 1954-55**) : Turrialba Pp. 88. (Mimeographed).

The work reported on includes a yield test with 81 varieties of rice in addition to that noted below.

Maize. A collection comprising 85 types from different regions of America has been established and the most promising of them are being selfed. Some of the hybrids between selections have exceeded the parents by 59% in yield.

Coffee. The collection comprises 214 types representing five species. Observations are being made on 302 progenies of *Coffea arabica* and studies on quality have been started.

Anales del II Congreso Nacional de Ingenieros Agrónomos, Julio 21–27, 1952. (**Report of the Second National Congress of Agricultural Engineers, 21-27 July 1952**). Lima 1952 : Pp. 868.

The papers presented to the congress, held at Lima, Peru, included the following contributions of interest to plant breeders.

296 *Echeandía Caulons, C. Nueva variedad de caña de azúcar C.E.C.(12)J.* [*A new variety of sugar cane, CEC(12)J.*] (*pp. 95–120*).

A brief review is given of the achievements of sugar-cane breeding in different parts of the world and of the results obtained in Peru with a number of introduced canes. From pollination of POJ2714 with H109, seedlings were obtained in 1932 and among them one proved outstanding in respect of vigour, earliness, resistance to drought, mosaic and other unfavourable conditions, depth of root system, yield, sugar content and quality of juice and this seedling ultimately gave rise to the cane CEC(12)J. Details of its performance under commercial conditions show that in yield of both cane and sugar per unit area it has exceeded the variety Cristalina by 100%. To produce one ton of cane the new variety required 1·36 kg. of nitrogen whereas POJ2878 required 1·70 kg.; the figures for water were 207 $m.^3$ for CEC(12)J and 286 $m.^3$ for POJ2878; similar differences were observed in amount of water per centner of sugar produced, this being 89 $m.^3$ for CEC(12)J and 133 for POJ2878. The yields of up to 1408·14 centners of sugar per fanegada* per year are the highest ever obtained in Peru and its performance has been specially promising in years affected by drought.

297 *Cox Valle Riestra, J. Algunas consideraciones sobre las variedades de caña de azúcar cultivadas, importadas y "seedlings", obtenidos por "cruzamiento" en la hacienda "Casa Grande"—valle Chicama. (Some considerations on the varieties of sugar cane cultivated and imported and on seedlings obtained by crossing at the Casa Grande estate, Chicama valley). (pp. 138–41).*

It is pointed out that the Javanese canes have given better results in Peru than varieties from Hawaii. Some of the seedlings produced at the Casa Grande experimental station, particularly Perú 12–745 and Perú 20–005, show promise of being better than POJ2878.

298 *Salhuana Mackee, W. El wilt del algodonero* (Verticillium albo atrum), *en relación con los riegos y linajes del algodón.* [*Cotton wilt* (V. albo-atrum) *in relation to irrigation and cotton lines*]. (*pp. 147–55*).

Eight lines selected from Tangüis cotton were studied under conditions of normal and deficient water supply. Lines LM12–40W and LM395–42W proved the most resistant to wilt; there was no significant correlation between wilt resistance and yield of the lines, LM12–20W having given the highest yields and LM395–42W being the most resistant.

299 *Páez Clivio, J. Estudio comparativo de linajes de algodonero de la variedad Tangüis. (Comparative study of cotton lines of the variety Tangüis). (pp. 155–69).*

Observations were made on 12 lines selected from Tangüis; line LMW395–42 gave the highest yield with 182·79 c. of raw cotton per fanegada in the first year and 164·73 c. in the second. This line was also wilt resistant and excelled the others in relative earliness, weight of lint per boll and lint length.

300 *Méndez Rodríguez, D. Creación de variedades precoces de algodón para la costa central. (Creation of early cotton varieties for the central coastal region). (pp. 169–71).*

The variety LM1041–49, selected from Tangüis, is wilt resistant, matures in 8 months, has a pull of 1$\frac{3}{16}$ to 1$\frac{1}{4}$" and yields 62 c. of lint per fanegada. From crosses of C3–38 x Cñ6–38 a hybrid, Hb.LM1948, with lint similar to Pima but maturing at the same time as Tangüis, has been obtained. Several lines without vegetative branches have been selected from the cross LMW467–45 x Karnak and lines with lint of the Tangüis type maturing in 6 months from LMW467–45 x U4.

301 *Lévano Aburto, A. Selecciones de algodón y sistemas de riego. (Cotton selections and systems of irrigation). (pp. 177–80).*

Observations on four Tangüis selections under conditions of normal and low water supply showed LM12–40W to be the best in yield and lint length in both cases.

302 *Calzada Benza, J. Estudio de las variedades e híbridos de papa de la Sierra. (Study of potato varieties for the Sierra). (pp. 483–500).*

Observations were made in various regions of the Peruvian highlands on a number of hybrids and the varieties most commonly grown in the respective areas, all of which are described. Hybrid CRIEAC11.50–11–47 of C. Ochoa surpassed the variety Casa Blanca by 48·5% in yield in the Junín area but was inferior in quality; Ccompis exceeded Casa Blanca by 46·3% in the Cuzco area but is defective in tuber form; in Apurímac the variety Ccoyllo, of superior tuber form and quality, exceeded Casa Blanca by 49·0% in yield and in the Canta zone hybrid CRIEAC92.11–47 showed promise.

303 *Páez [Páez Clivio], J. Estudio comparativo de variedades de papa. (Comparative study of potato varieties). (pp. 518–28).*

From observations on 26 Peruvian potato varieties it was seen that those that matured late were usually the highest yielders. Several of them outyielded the popular potato Chata Blanca Huasahuasi [Huasahuasi White Flat], the best in respect of yield and resistance to *Phytophthora infestans* being Gringo Mashi, Jiruco, Chata Blanca Lausa [Lausa White Flat] and Pilcush, all of which produced over 10,000 kg. of tubers per ha.

---

* 1 fanegada = 6·400 m^2.

304 *Villanueva Novoa, R. Herencia de la resistencia a la raza 15B de* Puccinia graminis tritici *y de otros caracteres en los cruces recíprocos de los trigos Kenya 58 y Spring Progress.* (*Inheritance of resistance to race 15B of* P. graminis *var.* tritici *and of other characters in reciprocal crosses of the wheats Kenya* 58 *and Spring Progress*). (*pp. 582–88*).

The F_2 of the cross comprised 848 resistant, 214 partially resistant and 68 susceptible plants, from which it is concluded that Kenya 58 contains two pairs of genes for resistance to race 15B. The awnlets of Kenya 58 behaved as a simple dominant to the awns of Spring Progress, a conclusion confirmed by the F_3 results. A 1 : 2 : 1 ratio for ear colour was observed (cf. *PBA;* XXIV, Abst. 1026).

305 *Cerrato V., A. Mejoramiento del maíz. La evaluación visual en A° en la selección para rendimiento.* (*Maize improvement. Visual evaluation in the S_0 generation in selection for yield*). (*pp. 598–600*).

Selection based on ear length, ear index and grain percentage leads to good yields and certain other correlations are indicated. These include height of plant with late maturity, and height of plant, leaf area and adventitious roots with vigour.

306 **Director's Annual Report of the Colombian Agricultural Program, May 1, 1954-April 30, 1955, Rockefeller Found., NY** : Pp. 153. (Mimeographed).

Wheat. A new variety Bonza has continued to yield well, and is resistant to yellow rust, *Puccinia glumarum*, of which a new race has appeared which severely attacks the hitherto resistant variety Menkemen. The breeding programme was checked by severe frosts and an epidemic of rust, which attacked some of the most promising lines. New sources of rust resistance from Mexico and the United States Department of Agriculture are being used.

Quality studies have been continued by the milling and baking laboratory which showed that local varieties produced flour equal or superior in quality to the imported controls used.

Maize. The programme of breeding improved varieties at the Montería, Palmira, Medellín and Bogotá stations is reported in detail. Colombia H–151 was released from Montería for use at 0–600 m., and Colombia H–251 from Medellín for use between 1000 and 1600 m. Both are white varieties, with some resistance to lodging, rust and *Helminthosporium.* It has been found that the high-altitude varieties from Bogotá, which normally take seven to eight months to mature, will mature in less than six months at Popoyán at 1800 m., thus allowing the production of two generations a year. The maize collection has been increased to 4900 by the addition of 150 new collections from Colombia and 1124 from other countries. The performance of these lines has been observed in several countries and many are already in use in breeding. Several lines resistant to *Fusarium* and *Diplodia* have been developed.

Barley. Seventy of the best lines from the breeding programme were selected on the basis of disease resistance, earliness, height and strength of straw and grain colour, for inclusion in field trials; nine of these are particularly promising. The variety Funza is now undergoing commercial increase. A preliminary study of the phenomenon of dwarfing suggests that it is due to a seed-borne virus and that expression of the symptoms depends on environmental conditions.

Potato. Clones have been developed which possess one or more of the following characteristics: high yield, frost resistance, early maturity, resistance to *Phytophthora infestans* and good cooking qualities. These will now be multiplied for distribution and use in breeding. Four races of *P. infestans* have been identified.

Bean. A large collection of foreign and native bean varieties is mentioned, which includes many with desirable agronomic characters, especially resistance to the important diseases occurring in Colombia. Many of these, together with varieties from the USA are being used in the breeding programme. In trials of cultural practices at Palmira it was found that Sangretoro is very resistant to drought, and will give yields above average even in very dry seasons. Liborino has been found to be highly susceptible to bacterial blight, and will only be of use in warmer regions. It does, however, possess considerable resistance to root rot. In addition to breeding for disease resistance, trials have been carried out of the effect of various fungicides on the incidence of disease in, and yield of, several commercial varieties.

307 Bonvicini, M.
Sementi "della fonte". (**Breeders' seed**).
Sementi elette 1956 : **2** : No. 5 : 10–16.

The author outlines the system of supplying foundation seed direct from the breeder and its importance in maintaining the level of varietal purity and general standard in economic plants.

308 Moja, A.
Ancora sugli aspetti genetici della meccanica agraria. (**Further remarks on the genetical aspects of the mechanization of agriculture**).
Sementi elette 1956 : **2** : No. 6 : 32–38.

In continuation of the article summarized in *PBA*, XXVI, Abst. 2139, the author discusses along what lines breeders should work in order to produce varieties of cotton, lucerne and carrots adapted to mechanized harvesting.

309 **Applying the hybrid corn method to other crops.**
NAAS quart. Rev. 1956 : No. 32 : 82–85.

The advantages of hybrid maize are outlined and the progress of the production of commercial hybrids of other crops is briefly surveyed, the examples given being the hybrid tomatoes Ware Cross and Hertford Cross recently released by the John Innes Horticultural Institution (cf. *PBA*, XXVI, Abst. 765), and the use of male sterility in the production of hybrid sugar beet seed (cf. *PBA*, XXIII, Abst. 2867), and in the development of hybrid grain sorghums in the USA (cf. *PBA*, XXV, p. 267).

310 Ahuja, M. R.
Chromosome numbers of some plants.
Indian J. Genet. 1955 : **15** : 142–43.

The following chromosome numbers, established at the Indian Agricultural Research Institute, New Delhi, are recorded: *Medicago glutinosa*, $2n = 16$; *M. obscura*, $2n = 16$; *M. prostrata*, $2n = 32$; *Trifolium balansae*, *T. globosum*, *T. isthmocarpum* and *T. tomentosum*, $2n = 16$; *Vicia biennis*, $2n = 14$; *Nicotiana campanulata* and *N. sanguinea*, $n = 24$; *Peristrophe bicalyculata*, $n = 15$; *Achyranthes aspera*, $n = 21$; *Heliotropium eichwaldi*, $n = 32$; and *Luffa graveolens*, $n = 13$.

Biochemie der Kulturpflanzen. (**Biochemistry of crop plants**).
Kulturpflanze, Berlin 1956 : Beiheft 1 : Pp. 273.

The following papers read at a meeting of the working committee of the Institute for Research on Crop Plants, Gatersleben, Germany, in July 1955 are of interest to readers of *Plant Breeding Abstracts*:—

311 *Schneider, A. Über den Kohlenhydratstoffwechsel reifender und lagernder Gemüseerbsen. (On carbohydrate metabolism in ripening and stored garden peas). (pp. 17–28).*

Significant differences in the rate of starch hydrolysis and change in mean contents of crude sugars were observed in a series of varieties examined at the Quedlinburg Plant Breeding Institute, Germany. The time at which the maximum content of raw sugars was reached also proved to be a varietal characteristic. The importance of these findings in the choice of varieties for canning and preserving is indicated.

312 *Korte, F. Zur Frage der chemischen Klassifizierung höherer Pflanzen. (On the question of the chemical classification of higher plants). (pp. 224–25).*

The value of chemical analysis in the systematic classification of higher plants is discussed briefly with special reference to the occurrence of different alkaloids in the Gentianaceae, Menyanthaceae, Loganiaceae, Contortae, Apocynaceae and Asclepiadaceae.

313 *Gröger, D. Qualitätszüchtung am Mutterkorn. (Breeding for quality in ergot). (pp. 226–38).*

Selection of strains of *Claviceps purpurea* producing increased yields of therapeutic drugs of improved quality is discussed. Work carried out at the Institute for Research on Crop Plants, Gatersleben, has resulted in the development of a number of highly promising strains (cf. Abst. 115).

314 Daniel, L.
Polleneltartás csírázóképes állapotban. (**Maintenance of germinating capacity in pollen**).
Növénytermelés 1955 : **4** : 315–22.

The percentage germination of pollen of *Nicotiana alata*, *N. glauca*, *N. langsdorffii*, *N. longiflora*, *N. noctiflora*, *N. suaveolens*, *N. sylvestris* and *N. tabacum*, stored for a year at – 5° C. and 50% relative humidity, was almost as high as that of fresh pollen. At a storage temperature of 7° C., 18% relative humidity reduced germination slightly and 100% was highly unfavourable.

Maize pollen stored for 10 days at 7° C. and 50–70% relative humidity was able to germinate but full germinating capacity was retained for six days only. Temperatures of – 5° to 20° C. and relative humidity of less than 50% were detrimental.

315 Ševčuk, T. N.
(The introduction nurseries of the Institute of Plant Industry).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 8 : 25–27. [Russian].

The following varieties of crop plants have been introduced by the Institute of Plant Industry and tested for the first time in the USSR.

Wheat. Nepolegajuščaja 506–F_2 [Lodging-resistant 506–F_2], from France, was distinguished among the winter wheats tested at Krasnodar by resistance to *Puccinia.* In irrigated trials at Taškent the Argentine spring wheats La Previsión 3, Klein Ceres, La Previsión 32 and Klein 66 showed resistance to lodging and diseases and outyielded the standard Surhak 5688. At Krasnodar, most Argentine spring wheats were characterized by *Puccinia* resistance and straw 15–40 cm. shorter than the local standard.

Maize. Goudster [Golden Star], CLVKB 6 Flint, Hybrid 3, Hybrid 12, Vroegegele Ronde CB [Early Yellow Round CB] and other introductions from the Netherlands were notable for early maturity and short habit. Hybrid 14 bore the longest ears. Most Chinese varieties were taller than the standard in the Kubanj and produced longer and more productive ears. Hua-Nung 2 [Chinese Agriculture 2] reached maturity 5 days earlier than the standard; most others were late forms. The Hungarian material showed great variability with regard to growth period, many varieties ripening appreciably earlier than the standard. Vassfile 28 and Szegedi Sárga Jófogú [Szeged Good Yellow Kernel] were 23–38 cm. taller than the standard. Dents and flints from Rumania and yellow-grained Canadian dents were also notable for tall habit. The Canadian material produced long productive ears.

Barley. Forrajera Klein and La Previsión 19 from Argentina and Cenad 396 from Rumania showed resistance to *Puccinia anomala.*

Hemp. A giant Italian form surpassed all others in length of stem. The French variety Ghenevis and an introduction from Rumania were also characterized by good length of stem.

Tomato. The best among introductions tested at Maĭkop were these from the Netherlands and France. Most were productive and had short growth periods.

Sokolov, S. J. [Editor]
(Plant introduction and construction of green belts).
Trudy Bot. Inst. Akad. Nauk SSSR (Trans. Bot. Inst. Acad. Sci. USSR) 1955 : No. 4 : Pp. 360. [Russian].

The 240th anniversary of the establishment of the Leningrad Botanic Garden in 1954 was the occasion of the compilation of this commemorative volume consisting of a series of essays on various aspects of the activities of the garden and associated institutions. The two essays of most interest to plant breeders are the following:—

316 *Sokolov, S. J. (Acclimatization of plants and the cultural and educational work in the Apothecary's Garden—now the Botanic Garden). (pp. 7–26).*

The introduction of *Eucalyptus,* tung, pecan, many citrus fruits, tea, wattle and other plants into cultivation in the Soviet Union are included among the many activities of the Leningrad Botanic Garden referred to in this historical account of its activities since its foundation in 1714.

317 *Golovač, A. G. & Raguzskaja, J. V. (The behaviour of some Mičurin varieties of fruit trees under Leningrad conditions). (pp. 129–38).*

A report is given on the behaviour of 51 of Mičurin's varieties of apple, pear and sour cherry planted in the botanic garden in Leningrad in 1948. The sour cherry Plodorodnaja Mičurina [Mičurin's Prolific] was distinguished by particularly heavy crops and a number of other varieties are indicated as being promising for cultivation in the Leningrad area.

318 Rudorf, W.
Neue Grundlagen und Methoden zur Züchtung auf Leistung. **(New principles and methods of breeding for yield).**
Z. Pflanzenz. 1956 : **35** : 441–60.

The literature on quantitative inheritance is reviewed with special reference to the genetical basis of morphological and physiological characters determining yield and the exploitation of heterosis both in self-pollinated and cross-pollinated crop plants. Different methods of selection for improved yield potential, including recurrent reciprocal selection, are outlined and results achieved in Germany and elsewhere by the use of modern methods of selection and hybridization are discussed.

Report of the 1955-1956 meeting of the Potomac Division of the American Phytopathological Society.
Phytopathology 1956 : **46** : 466–70.

Of the papers read at the above meeting, held at the Beltsville Plant Industry Station, Md., on 1 and 2 March 1956, the following, which are presented in abstract form, are of interest to breeders.

319 *Crittenden, H. W. Resistance of oat varieties to two species of root-knot nematodes. (p. 466).*

All the barleys and wheats tested in Delaware were resistant to *Meloidogyne hapla* and susceptible to *M. incognita* var. *acrita.* All oat varieties tested were also resistant to *M. hapla* but differed in reaction to the second species, the varieties resistant to *M. incognita* var. *acrita* being Arlington, Atlantic, Mustang, Lemont Cross, Coy, Frazier, De Soto, Victorgrain and Victoria.

320 *Gallegly, M. E. Progress in breeding for resistance to clubroot of broccoli and cauliflower. (p. 467).*

Plants resembling broccoli and cauliflower and possessing resistance to *Plasmodiophora brassicae* have been selected from crosses of the resistant cabbage 83–595s, from the University of Wisconsin, with commercial broccoli and cauliflower varieties. Segregation data indicate that resistance is controlled by multiple genes. Back crossing to obtain commercially acceptable resistant varieties is continuing.

321 *Heggestad, H. E. & Grosso, J. J. Resistance of* Nicotiana knightiana *and other tobacco species to rootknot nematodes. (p. 467).*

Of 48 species tested for reaction to *Meloidogyne incognita* var. *acrita, N. knightiana* developed the most extensive fibrous root system when inoculated, the plants remaining free or almost free of galls; *N. repanda* plants were entirely free of galls. A vigorous hybrid has been produced from *N. tabacum* x *N. knightiana* and is to be tested. Other species showing good resistance but requiring further testing were *N. arentsii, N. otophora* and *N. paniculata.*

322 *Morgan, O. D. Resistance in the F_1 progeny of the cross var. Maryland Catterton x* Nicotiana sylvestris *and var. Maryland Robinson x* N. sylvestris *to tobacco anthracnose. (pp. 468–69).*

When the moderately resistant species *N. sylvestris* (♂) was crossed with the susceptible tobacco Maryland Catterton and the highly susceptible variety Maryland Robinson, about half the F_1 plants in each cross resembled *N. sylvestris* in reaction to inoculation. The difference in susceptibility between Maryland Catterton and Maryland Robinson was not apparent in the F_1 progenies.

323 Rajháthy, T.
Szárazságellenálló fajták nemesítésének módszertani kutatásai. I. (**Investigations on methods of breeding varieties for drought resistance. I**).
Martonvásár. növényterm. Kutató Int. Évkön. 1950 (1952) : **1** : 67–93.

Methods of evaluating varieties for adaptation to conditions of drought or of irrigation are described, with special reference to investigations carried out at Martonvásár, Hungary, on varieties of barley, oats, flax, soya bean and tomato. The methods used involve determinations of the effects of different levels of moisture on yield and the various developmental phases. In studies of the influence of environment upon plant anatomy, evidence was obtained of a relationship between leaf structure and crop yield under drought, which may prove of value in breeding. Breeding is at present directed towards the development of resistant material by subjecting hybrid strains to increasing periods of wilting.

324 Kiss, Á.
Megfigyelések a betegségellenállóság és a polyploidia közötti összefüggésről. (**Observations on the relation between polyploidy and disease resistance**).
Növénytermelés 1955 : **4** : 299–304.

The following results of work on polyploidy and disease resistance are reported: (1) the susceptibility to mildew and rust of tetraploid Magyaróvár rye and Kisvárda rye was approximately equal to that of the corresponding diploids; (2) the resistance of *Triticum timopheevi* to mildew, leaf rust and stem rust was expressed in the F_1 and in amphidiploids of the cross *T. timopheevi* x *T. durum*; (3) F_1 hybrids of *T. turgidum* x Magyaróvár rye and *T. aestivum* x Magyaróvár rye and the amphidiploids with $2n = 42$ or 56 were largely resistant to mildew, leaf rust and stem rust, although both parents were in each case susceptible; and (4) the diploid lucerne varieties Gyula, B010 and 091–18 were only slightly susceptible to mildew and rust, but their artificially induced tetraploids were all highly susceptible.

325 SASSER, J. N.
Identification and host-parasite relationships of certain root-knot nematodes (*Meloidogyne* spp.).
Bull. Md. agric. Exp. Sta. 1954 : No. A–77 : Pp. 31.

Fifty plant species, including varieties of *Allium cepa, Arachis hypogaea, Avena sativa, Beta vulgaris, Brassica oleracea, Capsicum frutescens, Citrullus vulgaris, Cucumis* spp., *Cucurbita pepo, Daucus carota, Fragaria ananassa, Glycine max, Gossypium hirsutum, Hordeum vulgare, Ipomoea batatas, Lycopersicon* spp., *Medicago sativa, Nicotiana tabacum, Phaseolus vulgaris, Pisum sativum, Raphanus sativus, Secale cereale, Solanum* spp., *Triticum aestivum* and *Zea mays* were tested for susceptibility to five forms of root-knot nematodes, *Meloidogyne incognita, M. incognita* var. *acrita, M. hapla, M. javanica* and *M. arenaria.* The results are given in table form, showing degrees of susceptibility to each nematode species.

CEREALS

Journées nationales d'études théoriques et pratiques "Semences," Rennes 20 & 21 Juin 1955. (**National conference on the theoretical and practical study of seeds, Rennes 20-21 June 1955**). Pp. 113.

326 *Mayer. Le piétin du blé.* (*Foot rot of wheat*). (*pp. 17–24*).

Breeding for resistance to *Cercosporella herpotrichoides* and *Ophiobolus graminis* at the Central Station for Plant Breeding, Versailles, France, is discussed in general terms and the principal varieties of soft wheat cultivated in France are divided into three categories, depending on their degree of susceptibility to *C. herpotrichoides.*

327 *Jonard. Choix des variétés et adaptation des techniques culturales aux types de blé choisis.* (*Choice of varieties and adaptation of cultural techniques to the types of wheat chosen*). (*pp. 25–36*).

The author discusses, with reference to the physiological properties of some new varieties, the importance of ensuring that the wheat chosen by the farmer is adapted to the ecological conditions of the area in which it is to be grown, and the necessity of adapting cultural techniques to the requirements of the individual variety, expecially as regards the application of fertilizers. The most suitable varieties for the different regions of France are indicated.

328 *Lacoudre. Enquête sur les variétés de blé cultivées dans différentes régions françaises.* (*Inquiry into the varieties of wheat grown in different regions of France*). (*pp. 39–42*).

The results of a survey, carried out by the National Union of Agricultural Cooperatives for Cereal Crops, on the distribution of wheat varieties within France are discussed briefly and differences in the baking quality of the flour produced by the different regions are mentioned.

329 *Ponchet, J. Les races physiologiques de la rouille noire.* (*The physiological races of black rust*). (*pp. 65–69*).

Data on the comparative frequency and virulence of the different physiological races of *Puccinia graminis* f. *tritici* found in France are presented (cf. *PBA*, XXVI, Abst. 3202) and the occurrence of new races as the result of hybridization and mutation is discussed.

330 *Cotte, A. Les variétés de céréales à cultiver dans l'ouest de la France.* (*Cereal varieties for cultivation in the west of France*). (*pp. 91–99*).

Factors to be taken into consideration in the choice of varieties for a given region are listed and recommendations are made as to varieties of wheat, oats, barley and maize suitable for cultivation in different parts of western France.

331 **Field experiments, 1953.**
J. Dep. Agric. Éire, 1954–55 : **51** : 87–97.

The results of yield trials carried out on the following varieties in the Republic of Ireland by the county agricultural instructors are summarized: the wheats Atle, Progress, Kärn II [Kernel II] and Ella; the oats Triumph and Sun II; the barleys Ymer, Herta and Beorna; and the mangel Barres Øtofte Nova X and the forage beets Yellow Globe and Red Øtofte X.

332 **Cereal variety trials at the department's farms, 1953.**
J. Dep. Agric. Éire 1954–55 : **51** : 98–112.

A report is given of variety trials of wheat, oats and barley carried out on farms of the Department of Agriculture, Republic of Ireland.

In the barley trials, Spratt-Archer x Kenia selections produced at the Cereal Station, Ballinacurra, Co. Cork, compared favourably with the Scandinavian varieties Ymer, Herta, Bonus and Carlsberg in yield and grain quality.

333 **Report of the Seed Propagation Division, 1953.**
J. Dep. Agric. Éire 1954–55 : **51** : 113–23.

The activities of the above division of the Department of Agriculture of the Irish Republic included trials of varieties and Spratt-Archer x

Kenia selections of barley at the Cereal Station, Ballinacurra. It is hoped that selection 22/11 may meet the demand for a malting barley for highly fertile soils. Compared with Beorna, it is shorter and stronger strawed, higher yielding and earlier ripening.

334 MARINIČ, P. E.
(Introduce the best varieties of cereal crops to virgin land).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 1 : 37–45. [Russian].

The principal standards of wheat, *Panicum* millet and maize for the Volga Basin, Kazahstan and the territories east of the Urals are described. Many of the hard and soft wheats produce large grain of fine quality and are resistant to drought, lodging, shedding, *Puccinia*, *Tilletia* and *Ustilago*. Most of the millets show resistance to drought, lodging and shedding and some ripen early. Among the maize varieties, some late-ripening forms are distinguished by high forage yields; others are notable for short growth period and resistance to drought and do not lodge.

335 **Cereal news from Canada.**
Cereal News 1956 : **2** : No. 5 : 12–26.

Wheat. The rust-resistant soft white wheat Lemhi 53 (Kenya x Lemhi 5) has been approved (cf. *PBA*, XXIV, Abst. 2856).

Oats. The early variety 2928–Kap.–2–2, developed from the cross (Roxton x RL 1276) x (Ajax x RL 1276) at the Kapuskasing Experimental Farm, Ont., is likely to be distributed in northern and eastern Ontario in the autumn and a sister selection from the same cross is being increased in Indiana; both resemble Garry in rust resistance.

Barley. Two smooth-awned fodder barleys with white aleurone have been approved; the first, suitable for northern Ontario, is an early selection from Byng x Olli; the second, which resembles Brant in its high yield and mildew resistance but has better straw and is more easily threshed, is known as GB61 and comes from (Stephen x Galore) x Peatland. The malting barley Parkland has been licensed (cf. *PBA*, XXVI, Abst. 2326). Several strains from Kenate x Wong have shown high yield, mildew resistance and good straw strength at Ontario Agricultural College.

336 **Cereal news from other countries.**
Cereal News 1956 : **2** : No. 5 : 27–32.

Wheat. The new fodder wheat Russell is being distributed in Wisconsin (cf. *PBA*, XXVI, Abst. 3153). At North Dakota Experiment Station ND1 has been named Brawley, ND3 is called Conley and 3880–227 has received the name Ellar; all three are rust-resistant hard red spring wheats resembling Selkirk. The new durum varieties Langdon, Ramsey, Towner and Yuma, all of them resistant to race 15B of stem rust, have been released in North Dakota (cf. *PBA*, XXVI, Abst. 2121).

Oats. In Israel, a number of Minnesota selections from Landhafer x (Mindo x Hajira–Joanette) have shown some promise as crown-rust resistant material. The two new races 270 and 276 were prevalent in 1952–53; the only varieties resistant to them are Saia and Glabrota.

Barley. Fox is being released from the University of Wisconsin (cf. *PBA*, XXVI, Abst. 2144).

337 JURJEV, V. JA.
(The aims in breeding and seed growing).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 1 : 9–11. [Russian].

This article, dealing in general terms with breeding work on cereals, recapitulates the Mičurinist view that external conditions have heritable effects upon pure varietal material, including inbred lines. It is therefore thought that improved new varieties can be obtained by intravarietal selection.

338 WILD, A. S. & REEVES, J.
Cereal variety trials 1955-56.
J. Agric. W. Aust. 1956 : **5** : 297–309.

Tabulated data are presented on the yield and grain quality of varieties of wheat, oats and barley tested at six centres in Western Australia under different rainfall conditions. The wheat variety Bencubbin 48, the oat varieties Dale, Avon, Ballidu and Kent and the barley varieties Atlas and Beecher were found to be suitable for cultivation in all areas.

339 IKEDA, T., HIGASHI, S., KAWAIDE, T. & SAIGO, S.
(Studies on the resistance of cereal varieties to excessive moisture. II. Varietal differences in the resistance of cereals to excessive moisture).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1955 : No. 2 : 11–16. [Japanese].

Using the technique of growing on artificial ridges described in the first paper of this series (cf. *PBA*, XXV, Abst. 1822), the authors examined the degree of resistance to excessive moisture shown by a series of Japanese wheat and barley varieties. Considerable intervarietal differences in this respect were noted. In general, naked barleys were more resistant than hulled barleys.

340 IKEDA, T., HIGASHI, S., KAWAIDE, T. & SAIGO, S.
(Studies on the resistance of cereal varieties to excessive moisture. III. The relations between the resistance of cereal varieties to excessive moisture, the respiratory activity of the seedlings, and heading period).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1955 : No. 2 : 17–21. [Japanese].

Further to the researches summarized in Abst. 339, the authors established a negative correlation between the resistance to excessive moisture of wheat and barley varieties and the respiration rate of the seedlings. Early varieties may appear resistant since injury due to waterlogging is more serious when the soil temperature rises later in the season.

341 FUCHS, E.
Der Stand der Rassenspezialisierung beim Gelbrost *Puccinia glumarum* (Schm.) Erikss. et Henn. in Europa. [**The state of physiological specialization in yellow rust *P. glumarum* (Schm.) Erikss. et Henn. in Europe**].
NachrBl. dtsch. PflSchDienst., Berl. 1956 : **8** : 87–93.

Physiological races of *P. glumarum* found in Europe are listed, together with tabulated data on the host plants on which they are found, varietal differences in reaction, the countries in which the individual races occur, the relative importance of each race and the frequency with which it has been observed during the period 1927–54. Physiological specialization of the fungus during recent years has necessitated a revision of the test collections used for identifying races and calls for a review of the nomenclature of the races, as many strains at present described as races are probably only biotypes. A new test collection of spring and winter wheat varieties to be used for identifying physiological races of *P. glumarum* f. *tritici* and a new system of calculating the degree of susceptibility of individual varieties at different stages of development are described.

342 STEWART, D. M., COTTOR, R. U., ROBERTS, B. J. & HAYDEN, E. B.
Physiologic races of *Puccinia graminis* in the United States in 1955.
Plant Dis. Reptr. 1956 : Suppl. No. 239 : 99–105.

Twenty-eight biotypes of *P. graminis* var. *tritici* were identified among isolates from uredial collections of wheat, barley and grasses. Race 15B remained the most prevalent although showing a decrease as compared with 1953. Seven races of *P. graminis* var. *avenae* were identified, of which race 7 remained the most prevalent, showing an increase as compared with 1954. A rust was found for the first time on Saia oats; this was identified as a variant of race 5, and designated 5A.

343 HRUSHOVETZ, S. B.
Cytological studies of *Helminthosporium sativum*.
Canad. J. Bot. 1956 : **34** : 321–27.

It is shown that a cytological mechanism allowing the perpetuation of heterocaryons exists in *H. sativum*. Septa are laid down in such a way that usually the hyphal tips and mycelial cells are initially multinucleate. Hyphal fusions with subsequent nuclear migrations through the bridging hyphae occur in all parts of the colony. Several nuclei invariably enter the young conidium before its delimitation from the multinucleate conidiophore. The multicellular conidia exhibit polar or bipolar germination but only the nuclei in the terminal cells of the conidium enter the germ tube; the remaining cells degenerate. It is considered that the numerous variants reported for this species may be regarded as the result, not of an unusually high mutation rate as postulated by other workers (cf. *PBA*, XVIII, Abst. 1486), but of the perpetuation of heterocaryosis with occasional nuclear dissociation.

WHEAT

344 LUKJJANENKO, P. P.
(Changing the winter wheat varieties in the Kubanj).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 1 : 11–14. [Russian].

Recent trials of the varieties previously described in *PBA*, XXVI, Abst. 3193 are reported. Most have now been certified as standards. In the northern districts of Krasnodar the previous standard Vorošilovskaja is being superseded by the higher yielding Hybrid 481 and Novoukrainka 84, the former bred at the Stavropolj and the other at the Krasnodar breeding station. Both are strong wheats, Hybrid 481 being the hardier of the two and also more resistant to drought. Mention is made of a new *Triticum-Agropyron* hybrid, Ferrugineum 1126, bred at Krasnodar. It has good tillering capacity and a prostrate habit, is drought resistant and outyields Vorošilovskaja by 5·5 c. per ha.

345 Pesola, V. A.
Koetuloksia ja havaintoja kevätvehnän lajikekokeista Jokioisissa kesältä 1955 ja aikaisemmin. (**Experimental results and observations concerning spring-wheat variety trials at Jokioinen in the summer of 1955 and earlier**).
Maatalous 1956 : **49** : 31–34.

Experiments are described in which foreign and native Finnish varieties of spring wheat are compared for yield, properties of the stalk and grain, resistance to disease and earliness. Timantti [Diamond] is taken as the standard and various lines are mentioned which equal it in drought resistance and adaptability.

346 Wintertarwe, 1956. (**Winter wheat, 1956**).
Landbouwvoorlichting 13 : Bijl. 14; Ber. Rassenkeuze 1956 : No. 211 : Pp. 6.

Comprehensive tabulated data are presented on the relative yields and winter hardiness of 18 winter wheats tested on 7 different types of soil in the Netherlands in 1956. Heine VII, Carsten VI and Merlin (= Heine 51) combined high yields with a good degree of winter hardiness; Heine VII, however, is loosing ground because of its susceptibility to yellow rust. Leda, Panter and Lovink possessed a higher degree of winter hardiness than the above varieties but their yields were slightly lower at most localities. Two new winter wheats, Arletta and Hybrid 46, are described; both give high yields but lack winter hardiness.

347 (**New wheat varieties, 1955**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : p. 22. [Japanese].

The following recently introduced varieties are briefly described. Sakyuu (= Norin 91 [Ministry of Agriculture and Forestry 91]) (Norin 33 x Norin 27) is recommended for impoverished sandy soils in the Tohoku region of the Japanese mainland. Yutaka [Abundance] (= Norin 92) (Seikai 75 x Seikai 78) is a productive variety with stiff short straw. Danchi [Warm Districts] (= Norin 93) (Norin 60 x Seikai 91) is an early wheat recommended for the southern parts of the island of Kyushu.

348 Nakao, S. & Kawase, T.
Information of Nōrin wheat varieties in Japan.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 35.

Since 1926, 90 varieties have been registered under Norin [Ministry of Agriculture and Forestry] numbers. The pedigree of wheats developed for regions of snowfall is given to exemplify the fact that only a few selected parents have been used in breeding the Norin varieties.

349 Sen, S. & Pal, B. P.
Adaptability of some recently evolved new Pusa wheats.
Indian J. Genet. 1955 : **15** : 112–35.

The results of trials of the NP700 series, developed at the Indian Agricultural Research Institute, New Delhi, are presented (cf. *PBA*, XXIV, Abst. 247) and information is given as to the best varieties for cultivation in different parts of India. In most areas, one or more of the new varieties proved superior to the local control. NP710 is recommended for cultivation in Uttar Pradesh, Madhya Bharat, West Bengal and parts of Bombay; NP715 for parts of Bombay; NP718 for Delhi, southeast Punjab, southern Bihar, Rajasthan and Ajmer; NP758 for Rajasthan and Madhya Pradesh; NP760 for parts of Madhya Bharat; and NP761 for northern Bihar.

350 Negi, L. S.
The Punjab has these new improved wheats.
Indian Fmg. 1956 : **6** : No. 3 : 27–30.

The wheats C591, C518, C228, C250, C217, C253, C281, C273, C285 and C286 are described; the four last-mentioned have been developed recently. C281 (C591 x NP4), released in 1955, has outyielded C591 in certain districts. C273 (C591 x C209), C285 (C228 x B256G) and C286, which involves *Triticum durum*, *T. dicoccum* 'Khapli' and *T. vulgare* 'C591' and 'C250' in its parentage, are still under test; their promising characters include improved resistance to rusts.

Thirteenth annual report of winter wheat improvement in Ontario. 1955 crop. 1956 : Pp. 25.

351 *Waddell, W. H. Winter wheat improvement at the Ontario Agricultural College. (pp. 2–5).*

The red hybrid GC361 (Dawson's x Caldwell 10), which has given very high yields and shows considerable resistance to loose smut, was still segregating for white grains in the tenth generation and has had to undergo further selection. In regional tests, Genesee outyielded all the hybrids but was closely approached by GC491 (Aus1019 x Das) and GC507 (AusS996 x Das), both of which had particularly strong straw.

352 *Meyer, H. Studies on vernalization, and germination of immature seeds.* (*p. 6*).

Methods of shortening the life cycle of winter wheat were studied at Ontario with the aim of obtaining breeding results more rapidly. By means of vernalization carried out (*a*) in darkness at a low temperature or (*b*) under short day conditions at a somewhat higher temperature, followed by continuous light, and by using optimum conditions before and after vernalization, the growth period between germination and flowering could be reduced to 85 days. Dormancy could be avoided by harvesting the seeds in an immature state and drying under continuous light. Growing the excised immature embryos in culture media and later planting them in soil also shortened the life cycle, but this method was time consuming. By combining the most successful techniques it was possible to grow three generations in less than a year.

353 *Whiteside, A. G. O. & Edgar, J. Winter wheat improvement work at Central Experimental Farm, Ottawa.* (*pp. 7–10*).

A bunt nursery is being maintained at Ottawa, Ont., for the purpose of testing varieties and hybrids for resistance to *Tilletia foetida* and *T. controversa.* Richmond has shown good resistance to both types of bunt, as has also the hybrid 27–15 x Rex-Rio 53; the latter may be useful as a parent but it is low in yield and susceptible to mildew, loose smut and leaf and stem rusts and its grain is vitreous and not suitable for pastry flour.

Most winter wheats did better in biscuit-making tests than the soft white spring wheat Lemhi.

354 *Clark, G. H. Winter wheat improvement work at the Experimental Farm, Harrow,* 1955. (*p. 11*).

A number of selections have shown good leaf-rust resistance and some of these have given higher yields than Genesee.

In addition to the above reports, notes on quality of grain and flour and on yields of 13 wheats tested at seven stations are presented and data are provided in table form.

355 VILLANUEVA NOVOA, R.
El programa de mejoramiento de trigo en Méjico y su posible aplicación en el Perú. **(The programme of wheat breeding in Mexico and its possible application in Peru).**
Circ. Estac. exp. agríc. La Molina 1956 : No. 70 : Pp. 21. (Mimeographed).

Reference is made to the cooperative wheat breeding programme of the Rockefeller Foundation in Mexico, referred to in *PBA*, XXIII, p. 543 and XXIV, Abst. 1881, and it is pointed out that 75% of the wheat now sown in Mexico consists of varieties produced in this programme, the yield having increased from 1 to 3–4 and occasionally even 6 metric tons of grain per ha. Reference is also made to the plan to produce a composite variety, the composition of which can be changed with alterations in the rust races.

Tests were made in Mexico of 161 wheat selections made in Peru, some of which proved resistant to race 49 of *Puccinia graminis* although this race is not present in Peru. These tests showed the Mexican biotype of race 15B to be less virulent than the Peruvian biotype referred to as 15B–2P.

The Mexican system of composite varieties and the general scheme of breeding there applied is recommended for adoption in Peru.

356 **New S.A. wheat named.**
J. Aust. Inst. agric. Sci. 1956 : **22** : p. 151.

The new variety Claymore, from the cross Gabo x Dundee, is described briefly. Formerly known as RAC20, Claymore may be used to replace Bencubbin as a midseason variety in Southern Australia. It possesses the Gabo-type resistance to rust, is moderately resistant to flag smut and produces a flour of medium-strong quality.

357 CALDER, J. W.
Wheat breeders of New Zealand.
NZ Wheat Rev. 1953, 1954, 1955 (1956) : 13–16.

The achievements of F. W. Hilgendorf, C. M. Woodfield, O. H. Frankel and L. G. Copp in wheat breeding are briefly surveyed.

358 SEARS, E. R.
Neatby's virescent.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 5.

The gene for virescence (*v*) discovered in wheat by Neatby (cf. *PBA*, IV, Abst. 132) has since been found to be situated on chromosome III. When present in two doses *v* causes retarded development of chlorophyll. In one dose, whether heterozygous or hemizygous, *v* has no observable effect in light of normal intensity but in poor light it affects chlorophyll production adversely. Three doses of *v* cause albinism. The allele *V* shows no dosage effect and it is possibly a gene concerned with chlorophyll production but a nonessential one because of duplication at other loci. In order to determine whether *V* is involved in chlorophyll production, an attempt is being made to eliminate both it and one of its duplicate genes, which presumably lie on the homeologous chromosomes XII and XVI. Plants deficient for *v* have been obtained by means of X-ray treatment and are to be crossed with nulli-XII and nulli-XVI stocks.

359 **Wheat cross promising.**
What's New Crops Soils 1956 : **8** : No. 9 : p. 24.

Mention is made of selections from Improved Blue Jacket x Comanche tested in Oklahoma. One selection has shown stiff straw and good baking quality.

360 **Notes from Crop Research Division.**
NZ Wheat Rev. 1953, 1954, 1955 (1956) : 64–66.

The following wheat breeding work is in progress at the New Zealand Crop Research Division. In the course of developing a general-purpose wheat of the Cross 7 type with higher yields, good quality selections from a short-strawed hybrid free from lodging and shattering are undergoing trial. Attempts are being made to develop an early-maturing variety that will not lodge to replace Tainui in the North Island. Arawa (cf. *PBA*, XXVI, Abst. 1084) and Hilgendorf are undergoing selection for improved yield. Lines from Hilgendorf x Cross 7 are being tested in large-scale trials. A mildew-resistant line of Cross 7 is being developed. Hybrids are being tested for suitability for growing under irrigated conditions.

The inheritance of yield components, resistance to shattering, protein content, resistance to mildew and purple grain colour is being studied.

361 WEIBEL, D. E.
Inheritance of quantitative characters in wheat.
Iowa St. Coll. J. Sci. 1956 : **30** : 450–51. (Abst.).

The F_1, F_2 and F_3 populations of five hard red winter wheat crosses were evaluated for six quantitative plant and seed characters. A comparison of F_1 means with mean parental values indicated that, in all crosses, earliness, tallness, many heads, high yield, high kernel weight and high bushel weight were dominant or partially dominant. Heterosis was evident in 43% of the F_1 comparisons, 25% of the F_2 comparisons and 23% of the F_3 comparisons for all characters in all crosses, being most evident for grain yield and least evident for bushel weight. The average of 25 estimates of heritability for each character over all the crosses gave the following values: date of first flower, 36%; plant height, 50·2%; kernel weight, 45·2%; and bushel weight, 49·5%. It is concluded that for these characters, individual plant selection would prove effective, while it would not for number of heads and grain yield, which had heritability values of only 1·3 and 7·7% respectively.

Early flowering was phenotypically correlated with many heads, high grain yield, high kernel weight and high bushel weight and with short plants in some crosses and tall plants in others. Tall plants were strongly correlated with many heads, high grain yield and, in certain crosses, high kernel weight and high bushel weight. Other high correlations were: number of heads with grain yield; high grain yield with high kernel weight and high bushel weight; and kernel weight with bushel weight.

Environmental correlations involving number of heads or grain yield were generally larger and genetic correlations smaller than phenotypic correlations, while the reverse was generally true for the other characters studied.

362 RAJHÁTHY, T.
Triticum carthlicum Nevski és nemesítési értéke. (***T. carthlicum* Nevski and its breeding value**).
Növénytermelés 1955 : **4** : 305–14.

T. carthlicum resembles *T. timopheevi* in being resistant to leaf rust, stem rust and mildew, but is considered to be of greater breeding value because (*a*) it has a tough rather than a brittle rachis and is easily threshed and (*b*) its F_1 hybrids with *T. aestivum* are fertile while those of *T. aestivum* x *T. timopheevi* are highly sterile. *T. carthlicum* has also been crossed successfully with *T. spelta*, *T. timopheevi*, *T. monococcum*, *Agropyron intermedium* and *Secale cereale*.

363 CELARIER, R. P.
Tertiary butyl alcohol dehydration of chromosome smears.
Stain Tech. 1956 : **31** : 155–57.

Details are given of the above technique used by E. R. Sears in investigating amphidiploids in the Triticinae (cf. *PBA*, XIV, Abst. 830). Slides prepared by the method have retained their stain and clarity for as long as 8 years.

364 Pisarev, V. E. & Shilkina, M. D.
Application of boron in breeding polyploid forms.
Indian J. Genet. 1955 : **15** : 55–58.

In experiments at the USSR Institute of Plant Breeding, Leningrad, on amphidiploid progenies of spring wheat x spring rye, *Triticum timopheevi* x *T. monococcum* and (*T. monococcum* x *T. persicum*) x *T. vulgare*, an improvement in the number of viable grains obtained per ear was effected by sprinkling the growing plants with a 0·05% solution of boric acid once a week. This method of applying boron is claimed to intensify sugar synthesis and accelerate its inflow into the grain-bearing organs and to assist in the development of the embryo and the endosperm. In experiments in which a number of varieties of *T. vulgare* were pollinated with pollen of a Siberian form of spring rye, marked differences were observed in the F_2 amphidiploid hybrids in number of grains produced per ear; amphidiploids obtained by using a Chinese variety, VIR29087, as ♀ parent set the highest number of grains per ear.

365 Tabushi, J.
Hybrids between synthesized 6*x* wheat, ABD No. 4, and a Japanese commercial wheat variety, Nōrin No. 25.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 14–15.

A brief account is given of investigations on the cross of the synthesized hexaploid ABD4 (*Triticum persicum* var. *stramineum* x *Aegilops squarrosa*) with Norin 25 [Ministry of Agriculture and Forestry 25]. The F_1 plants were vigorous with fairly regular chromosome pairing. One F_1 individual had 80% pollen fertility and was 84·2% seed fertile when selfed. The 39 F_2 plants obtained from this F_1 individual were also fairly regular in meiosis; average fertility in the F_2 and F_3 was high. Some F_2 and F_3 segregates were superior to the parents in the size, weight and flintiness of the grain and were earlier flowering than the F_1 individual which was intermediate between the parents in this respect.

366 Matsumoto, K. & Tabushi, J.
Amphidiploids from the hybrids *T. timopheevi* x *Ae. umbellulata* and *T. vulgare* x *Ae. kotschyi*.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 15.

It is noted that the former of the above colchicine-induced amphidiploids and its progeny have shown a fairly high degree of pairing at metaphase I, in contrast to the latter and its progeny in which univalents have been frequently observed.

367 Fukasawa, H.
Chlorophyll variegation which appeared in male-sterile Emmer wheat.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 19.

This note refers to a type of variegation attributed to interaction of the cytoplasm of *Aegilops ovata* with the genomes of *Triticum durum* in male-sterile back crosses.

368 Roy, R. P.
Semi-lethal hybrids in crosses of species and synthetic amphidiploids of *Triticum* and *Aegilops*.
Indian J. Genet. 1955 : **15** : 88–98.

Amphidiploid hybrids of *T. dicoccoides* x *A. bicornis* were crossed with a number of hexaploid wheat varieties and with other intergeneric combinations of *Triticum* and *Aegilops*. Hybrid combinations of (*T. dicoccoides* x *A. bicornis*) x *T. aestivum* and its reciprocal and of (*T. dicoccoides* x *A. bicornis*) x *T. spelta* produced semilethal plants, nearly all of which died at the 2–3 leaf stage. When, however, the same amphidiploid, *T. dicoccoides* x *A. bicornis*, was crossed with either of the amphidiploids *T. turgidum* x *A. sharonensis* or *A. longissima* x *T. dicoccum*, the resulting hybrid plants were completely normal. A comparison of the behaviour of these two groups suggested that semilethality was associated with certain genes present in the amphidiploid *T. dicoccoides* x *A. bicornis* which, however, produced semilethality only in the presence of certain genes in the hexaploid wheats; a number of complex crosses further led to the conclusion that it was the reaction of certain genes of the genome S^bS^b, derived from *A. bicornis*, in the amphidiploid, with certain genes of the genome DD in the hexaploid wheat that was responsible. To test this hypothesis, use was made of amphidiploid crosses involving *A. squarrosa*, which was thought also to contain the DD genome (cf. *PBA*, XIX, Abst. 2483); the crosses (*T. dicoccoides* x *A. bicornis*) x (*T. dicoccoides* x *A. squarrosa*) and (*T. dicoccoides* x *A. bicornis*) x (*T. timopheevi* x *A. squarrosa*) also produced semilethal plants, whereas the amphidiploid *T. dicoccoides* x *A. bicornis*, when crossed with the amphidiploids *T. dicoccoides* x *A. sharonensis* or *T. timopheevi* x *A. bicornis*, produced normal plants. The results of this second series of crosses thus support the hypothesis suggested by the first series and also indicate that *A. squarrosa* possesses several genes in common with *T. aestivum* (cf. *PBA*, XVII, Abst. 166). At meiosis in the surviving plants of the semilethal combinations, univalents were frequent and all plants were completely sterile.

369 KUCKUCK, H. & POHLENDT, G.
On a natural hybrid between *Aegilops triuncialis* and *Triticum aestivum* found in Iran and its cytogenetical significance.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 15–17.

Ae. triuncialis x *T. aestivum* hybrids appeared in a collection of *Ae. triuncialis* grown at the Iranian Agricultural Experiment Station, Karaj. The few F_2 hybrids obtained from open-pollinated seed exhibited mosaicism with respect to characteristics of *Aegilops* and wheat and also chromosome number. Part of the same collection was grown in Germany and gave rise to one hybrid in which $2n$ approached 35 in the earlier stage of development of the plant but varied from 9 to 50 after heading.

370 SARKAR, P. & STEBBINS, G. L.
Morphological evidence for the origin of the B genome in wheat.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 20.

Morphological comparison of cultivated and wild forms of *Triticum monococcum* with Emmer wheats, followed by use of Anderson's method of extrapolation, suggested that the latter wheats arose as amphidiploids between *T. monococcum* and its relatives on the one hand and diploids similar to *Aegilops speltoides* on the other. It is postulated that amphidiploidy occurred several times, hybridization among the new amphidiploids being accompanied by chromosome rearrangement and gene mutation, so that the A genome of *T. monococcum* and S genome of *Ae. speltoides* became modified into the A and B genomes of the modern $4n$ and $6n$ wheats.

371 TANAKA, M.
Chromosome pairing and fertility in the hybrid between the new amphidiploid-S^1S^1AA and Emmer-wheat.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 21–22.

The amphidiploid *Aegilops longissima* (S^1S^1) x *Triticum aegilopoides* (AA) formed 11–14_{II}, with the mode at 14; it had 90·3% and 84·3% pollen fertility in 1954 and 1955 respectively. Its seed set when selfed or open pollinated was fairly good. In the sterile hybrid between the amphidiploid and *T. durum*, 5–9_{II} and 10–18_{I} were observed, the modes being at 7 and 14 for bivalent and univalent formation respectively. The 7_{II} are attributed to allosyndesis between chromosomes of the A genomes, no evidence of homology between the S^1 and B genomes being obtained. Morphological similarities and disparities between the amphidiploid and $4n$ wheats are noted.

372 **Resistance—from grass to wheat.**
Agric. Res., Wash. 1956 : **5** : No. 2 : 8–9.

This popular article describes the method of introducing the rust resistant character of *Aegilops umbellulata* into Chinese Spring wheat. *A. umbellulata*, with $2n = 14$, was crossed with Emmer wheat, $2n = 28$, to give a sterile triploid, $3n = 21$. The chromosome number was doubled by colchicine treatment and the resulting fertile plant crossed with Chinese Spring wheat and the F_1 back crossed to Chinese Spring. In the second back-cross generation a plant was found with 43 chromosomes, one of which was derived from *A. umbellulata* and carried a gene for rust resistance, together with several undesirable characters. After X-ray treatment this plant was used as the pollen parent in a cross to normal Chinese Spring and one of the offspring was found to have acquired the gene for rust resistance without any other characters from *A. umbellulata* and to have $2n = 42$.

373 COFFEY, L. C.
Interspecific and intergeneric hybrids of *Triticum* and related genera.
Iowa St. Coll. J. Sci. 1956 : **30** : 342–43. (Abst.).

Triticum spelta 'Red Winter' and synthetic *T. spelta*, an allohexaploid from *T. dicoccum* x *Aegilops squarrosa*, were crossed with a derivative of (*T. dicoccoides* x *Ae. speltoides*) x *T. aestivum* 'Austin', which is resistant to all known races of stem rust. The F_1 progenies were field resistant to all races present and segregation for resistance occurred in the F_2. About 5% of the F_2 plants were nullisomic. Since the *Ae. speltoides* factors for resistance to race 15B were situated on chromosomes which pair with those of *T. aestivum*, it is thought that this type of resistance may occur in some wheat varieties. The close linkage between stem-rust resistance and undesirable spike type in the *Ae. speltoides* derivative was broken in the F_2 of the cross with natural *T. spelta*.

All F_1 plants from the following crosses were largely sterile: *T. spelta* x synthetic *T. spelta* and the reciprocal; *T. spelta* x an allohexaploid of *T. timopheevi* x *Ae. squarrosa*; and (*T. aestivum* x *Secale cereale*) x *Agropyron elongatum* x *T. aestivum* 'Cheyenne' crossed with synthetic *T. spelta.* Most F_2 plants from crosses of both natural and synthetic *T. spelta* with *T. aestivum* 'Supremo' and 'selection 131' showed high and moderate fertility respectively; most F_2 plants from wheat-rye-*Agropyron* x *T. spelta* showed more than 80% fertility; most from a cross of the allohexaploid *T. durum* x *Ae. squarrosa* with synthetic *T. spelta*, 41–60% fertility; and most from the cross of the allohexaploid *T. timopheevi* x *Ae. squarrosa* with synthetic *T. spelta*, less than 20% fertility. No F_1 plants of the cross between the allohexaploid *T. durum* x *Ae. squarrosa* survived, suggesting that the parents carried complementary dominant lethal factors. Several selections resistant to all stem rust races were obtained from (*T. timopheevi* allohexaploid x synthetic *T. spelta*) x *T. aestivum* 'selection 131'. The F_2 populations of crosses involving an allohexaploid were more fertile than would be expected if the allohexaploid parent were to be replaced by its constituent tetraploid. In crosses of natural and synthetic *T. spelta* with the *T. aestivum* varieties, with an *Agropyron* selection and with the wheat-rye-*Agropyron* derivative, the F_2 segregated in the approximate ratio of 3 speltoid spikes : 1 free-glumed spike. In *T. spelta* x *Agropyron*, the perennial habit occurred in all F_1 plants, in 23% of the F_2 and in less than 50% of the F_3 plants derived from the perennial F_2 individuals.

374 KISS, Á. & RAJHÁTHY, T.
Untersuchungen über die Kreuzbarkeit innerhalb des Subtribus *Triticinae.* (**Investigations on crossability within the subtribe *Triticinae*).**
Züchter 1956 : **26** : 127–36.

The literature on intergeneric crosses between wheat and rye and between wheat and *Agropyron* is reviewed with reference to results obtained by the author. At the Institute for Research on Crop Plants, Martonvásár, Hungary, selected lines of Bánkút 1201, Fleischmann 481 and Thatcher, employed as ♀ parents, gave the best results in crosses with rye and the rye varieties Kisvárda and Magyaróvár were the best pollinators. Pollination with mixed pollen gave better results than when the pollen of only one variety was used. Hexaploid wheat pollinated with rye pollen gave a higher seed-set than tetraploid wheat pollinated with rye pollen and tetraploid wheat gave a higher seed-set than diploid. Pollination of tetraploid or hexaploid wheat with pollen of tetraploid rye gave better results than pollination with pollen of diploid rye. In crosses of *Triticum timopheevi* with hexaploid wheats, a higher percentage of germination was obtained when the parent with the higher chromosome number was used as the ♀. Crosses between wheat and *Agropyron* were more successful when the wheat was used as the ♀ parent than when it was used as the ♂. *A. intermedium* was more easily crossed with tetraploid wheat than was *A. elongatum* but in crosses involving hexaploid wheat the reverse held true. At Martonvásár, biotypes of wheat have been selected that are more easily crossed with rye than are their parent forms. In addition, lines of *A. intermedium* and *A. elongatum* that lend themselves more readily to crossing with wheat have been selected.

375 SANCHEZ-MONGE, E.
Fertility in *Triticale.*
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 29–30.

Under Spanish conditions, 42-chromosome *Triticale*, with *Triticum durum*, *T. dicoccum* or *T. dicoccoides* as the wheat parent, compared favourably in seed fertility with 56-chromosome types of *Triticale* from Sweden and Denmark.

376 SANCHEZ-MONGE, E.
Crossability of tetraploid wheat species with cultivated rye.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 30.

A table gives data on the crossability of *Triticum durum*, *T. turgidum*, *T. polonicum*, *T. carthlicum*, *T. dicoccum*, *T. dicoccoides* and *T. timopheevi* with rye, as observed at the Aula Dei Experimental Station, Spain. *T. durum* showed the highest crossability (0·9%), and *T. carthlicum* and *T. dicoccoides* the lowest (0·2%).

377 NAKAJIMA, G.
(**Cytogenetical studies on F_1 hybrids between *Triticum compactum* and 3 species of *Secale***).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **5** : 237–46. [Japanese].

The morphology and meiotic behaviour of F_1 intergeneric hybrids between *T. compactum*, *S. africanum*, *S. montanum* and *S. vavilovi* are described. The modal bivalent number in each hybrid is 0_{II} though the bivalent frequencies are different.

378 SAKANAGA, K.
Cytological studies of hybrids involving *Triticum durum* and *Secale cereale.*
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 23–24.

A high frequency of 14_{II} occurred among the configurations at metaphase I in crosses of *Triticale* (allopolyploid of *T. durum* 'Carleton' x *S. cereale*) with *T. durum* 'Iumillo', 'FPI94587' and 'Stewart'. Quadrivalents usually in the form of rings were also noted. Progenies produced by selfing or back-crossing the hybrids segregated into ring-forming and normal plants, evidence of reciprocal translocation between the wheat chromosomes thus being provided. Two hybrids with $2n = 27$, three with $2n = 26$ and one with $2n = 25$ were obtained from the cross of *Triticale* with spring rye. The plants with $2n = 27$ had a hairy peduncle whereas in the other four the peduncle was not pubescent. In the latter hybrids, the number of bivalents most frequently observed was 5; the plants with $2n = 27$ had modes of 3_{II} and 6_{II} respectively. A 29-chromosome plant monosomic for chromosome I of rye was derived from a back cross of *Triticale* x FPI94587 to Khapli. The presence of this chromosome adversely affected plant height and increased the frequency of asynapsis of one or two pairs of wheat chromosomes.

379 NAKAJIMA, G.
Frequency of bivalents in meiosis of intergeneric F_1 hybrids between Emmer or *Timopheevi* wheat and *Secale*.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 25–26.

NAKAJIMA, G.
Frequency of bivalents in meiosis of intergeneric F_1 hybrids between Dinkel wheat and *Secale*.
Ibid. 1956 : No. 3 : 27–28.

Tables are given denoting the bivalent formation observed at the Biological Laboratory, Gumma University, Japan, in (1) intergeneric hybrids involving *T. durum, T. turgidum, T. persicum, T. dicoccum, T. pyramidale, T. polonicum, T. timopheevi, S. cereale, S. africanum, S. montanum* and *S. vavilovii*; and (2) intergeneric hybrids involving *T. vulgare, T. compactum, T. spelta, T. macha, T. sphaerococcum* and the above-mentioned species of *Secale*.

380 NAKAJIMA, G.
(Cytogenetical studies on hybrids between *Triticum persicum* and 2 species of *Secale*).
Senshokutai (Chromosome)/Kromosomo 1956 : 973–86. [Japanese].

A description is given of the morphology and cytology of F_1 hybrids of *T. persicum* x *S. africanum* and *T. persicum* x *S. montanum*. Fertility in the first cross was remarkably high (up to 94·99% seed per spikelet). Meiosis in this cross was of two types: (1) a metaphase configuration with the mode of 0_{II}, followed by irregular chromosome segregation; or (2) the formation of $2n$ restitution nuclei, which occurred in 55·67% of cases. In the second cross, the modal bivalent number was also 0_{II}. Restitution was not noted.

381 RÉDEI, GY.
Triticum durum abyssinicum x *Secale cereale* hybridek előállítása mesterséges embryo nevelés segítségével. **(The production of hybrids of *T. durum abyssinicum* x *S. cereale* by means of artificial embryo culture).**
Növénytermelés 1955 : **4** : 365–67.

Embryos resulting from crosses between *T. durum* var. *abyssinicum* and the Canadian spring rye Prolific failed to develop in the ear because of developmental disorders of the endosperm but by means of embryo culture in test tubes on a nutrient medium containing mineral salts, 3% sugar, 0·8% agar and 0·5% casein hydrolysate four sterile hybrid plants were raised from the 18 seeds produced by nine crossed ears.

382 MURAMATSU, M.
An F_1 hybrid between *T. durum* 8*x* and *Agropyron trichophorum*.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 31.

An F_1 hybrid of 8*x* *T. durum* var. *hordeiforme* and *A. trichophorum* ($2n = 42$) had $2n = 50$. The 14_{II} showing strong pairing are attributed to autosyndesis of chromosomes belonging to the A and B genomes of *T. durum*. The single trivalent observed in some configurations is attributed to association involving an extra chromosome from the *T. durum* gamete. Additional bivalents numbered only 0–3; this observation supports the view that the three genomes of *A. intermedium*, which appears to have the same genome constitution as *A. trichophorum*, are not homologous. Pollen fertility was 20·4%. The single F_2 plant obtained by artificial selfing had $2n = 54$.

383 ELLIOTT, F. C.
Spring wheat breeding and the transfer of economic characters from related species and genera.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 30.

By means of X irradiation and back crossing, 42-chromosome wheat plants have been produced which possess bunt resistance derived from *Agropyron elongatum* (cf. *PBA*, XXVI, Abst. 1035). Plants with $2n = 42$ or 43 have been obtained from an X_3 progeny homozygous for resistance to races of rust, including race 15B of stem rust. The material was developed by treating F_0 seed ($2n = 49$) obtained from a cross between a rust-resistant 56-chromosome wheat-*Agropyron* derivative and a susceptible spring wheat with 18,000 r. Octoploid wheat-like hybrids are to be intercrossed and irradiated in an attempt to develop wheat types at this level of polyploidy.

384 Schmidt, J. W., Webster, H. S. (Jun.) & Fellows, H.
Range of reactions to wheat streak-mosaic virus in hybrids derived from *Triticum vulgare* x *Agropyron elongatum*.
Agron. J. 1956 : **48** : 371–73.

The reaction of derivatives of *T. vulgare* x *A. elongatum* crosses to wheat streak-mosaic, when inoculated in the greenhouse, ranged from immunity and a high degree of resistance to systemic ultrasusceptibility, including lethality. Intermediate reactions were represented by local-lesion types, symptomless carriers, and systemically infected but tolerant types. The range and diversity of the reactions suggest that the genetics of the immunity of *A. elongatum* may be complex, in which case transference of a satisfactory degree of resistance to wheat may present difficulties. The value of the local-lesion type of resistance is stressed. The F_1 of the cross between the *Triticum-Agropyron* hybrid 52–6605, having this type of resistance, and Pawnee also developed local lesions.

385 Swarup, V., McCracken, E. U., Sill, W. H. (Jun.) & Schmidt, J. W.
A cytogenetical analysis of reactions to wheat streak-mosaic virus in certain Agrotricum hybrids.
Agron. J. 1956 : **48** : 374–79.

F_1 plants from the cross of an advanced hybrid of *Triticum vulgare* x *Agropyron elongatum*, having the local-lesion type of resistance to wheat streak-mosaic, with Pawnee also showed the local-lesion reaction. The F_2 and F_3 segregated at random into plants with three types of reaction: systemic (S), local lesion (LL) and local lesion followed by systemic infection (LL/S). The back cross of the F_1 plants to Pawnee ♂ also segregated at random with respect to these three types but its progeny consisted only of S and LL/S plants. The F_1 plants of the original cross had on the average 48·16 chromosomes and 8·47 univalents. In the F_2, LL plants had the highest average numbers of chromosomes (49·5) and univalents (4·82), and the S plants the lowest, with 43·6 and 2·72 respectively. In the back cross to Pawnee, the average numbers of chromosomes and univalents were 43·0 and 2·41 respectively. F_2 plants belonging to the three reaction types also differed in the size of the univalents. Univalents of genomes X or Y of *A. elongatum* carried the genes for the LL reaction; the chromosomes of these genomes are not homologous with wheat chromosomes and are therefore liable to be eliminated in later generations or back crosses. The F_2 LL plants were grass-like whereas S and LL/S types were more wheat-like. The genes for such characters as long narrow spikes and kernels are therefore probably situated on the same chromosomes that carry the factors for the LL reaction.

386 Andrews, J. E. & Slykhuis, J. T.
Reaction of winter wheat varieties and *Triticum* x *Agropyron* hybrids when inoculated with streak mosaic virus by the mite vector *Aceria tulipae* Keifer.
Plant Dis. Reptr. 1956 : **40** : 513–16.

All the 1124 accessions of common wheat tested were susceptible to streak mosaic when inoculated by the above vector in the greenhouse. Sixteen *Triticum-Agropyron* derivatives were resistant and five were symptomless carriers. The mites failed to survive or reproduce normally on most of the resistant lines.

387 Žebrak, A. R. & Afanasjeva, A. S.
(The production of an amphidiploid by crossing two autotetraploid wheats).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1948 : **59** : 1175–78. [Russian].

A fertile amphidiploid characterized by a non-brittle ear is described. It was obtained by colchicine-induced chromosome doubling in *Triticum durum* and *T. timopheevi* and intercrossing the resultant autotetraploids. It is considered that the experiments prove that chromosome doubling is the real cause of improved fertility as compared with the ordinary hybrid, and that the improvement is not just a physiological effect of the colchicine.

388 WATANABE, Y., MUKADE, K. & KOKUBUN, K.
(Studies on the production of amphidiploids as a source of resistance to leaf rust in wheat. II. Cytogenetical studies on the F_1 hybrid of *Triticum timopheevi* Zhuk. x *T. monococcum* and on the amphidiploid).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 23–31. [Japanese].

The morphology and meiotic behaviour of the above hybrid and its colchicine-induced amphidiploid are described. The modal configuration of the hybrid is $6_{II} + 9_{I}$; in the amphidiploid, the mode is at $2_{IV} + 17_{II}$. The amphidiploid can be crossed with *T. vulgare* and *T. timopheevi* but not with *T. monococcum.* The amphidiploid is immune to many races of *Puccinia triticina* (cf. *PBA*, XXVI, Abst. 2246).

389 SCHIEMANN, E. & STAUDT, G.
***Triticum dimococcum*, a new amphidiploid from the hybrid *Triticum dicoccum* x *monococcum*.**
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 3–5.

The above colchicine-induced amphidiploid showed none of the characteristics of hexaploid wheats. No support was therefore obtained for Bertsch's contention that *T. compactum* is a hybrid of *T. monococcum* x *T. dicoccum.*

390 Obtention d'hybrides intergénériques *Aegilotricum* (*Aegilops* x *Triticum*) amphidiploïdes. [**Production of amphidiploid *Aegilotricum* (*Aegilops* x *Triticum*) intergeneric hybrids**].
CR Acad. Sci., Paris 1956 : **243** : 863–66.

Hybrids obtained from crosses between *A. ventricosa* on the one hand and *T. dicoccoides* and *T. timopheevi* on the other were treated with colchicine, giving rise to fertile amphidiploids with $2n = 56$. The hybrids inherited the resistance of *A. ventricosa* to *Cercosporella herpotrichoides* and may be of value in breeding for resistance to *C. herpotrichoides* in soft wheats.

391 SÁNCHEZ-MONGE, E.
Studies on 42-chromosome *Triticale*. I. The production of the amphiploids.
An. Estac. exp. Aula Dei 1956 : **4** : 191–207.

A report is given of the results of crossing *Triticum durum*, *T. turgidum*, *T. polonicum*, *T. carthlicum*, *T. dicoccum*, *T. dicoccoides* and *T. timopheevi* as female parents with *Secale cereale* at the Aula Dei Experimental Station, Spain. Many wheats and ryes of diverse origins were used; most of the rye parents consisted of inbred lines selected for self fertility. Of the 305 combinations attempted, 54 produced one or more F_1 plants with 21 chromosomes. Hybrids involving all the *Triticum* species were obtained. Nine *Triticale* types ($2n = 42$) were induced by treating the F_1 plants with colchicine; the wheat parents of these amphidiploids were *T. dicoccum*, *T. durum* and *T. dicoccoides*.

392 FUJII, T.
Virido-albina mutant in diploid wheat induced by X-rays.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 11–12.

The *virido-albina* seedling mutant appeared in the X_2 obtained from seeds of *Triticum monococcum* var. *flavescens* treated with 8100 r. at 180 KVP. About three-fourths of the base of each leaf were white, the rest being light green. With exposure to fluorescent light in a phytotron at 20° C., the leaves gradually became green and after about 15 days the mutant resembled the *basi-viridis* mutant with a light-green base of the leaf. After treatment for a further 30 days, the mutant had a normal chlorophyll content. Given similar treatment, the *basi-viridis* mutant, but not the *albina*, *chlorina* and *striata* variants, also showed an increase in chlorophyll content. *Virido-albina* plants produced seed in the phytotron although in the field such plants did not survive. Cytochrome-oxidase activity in the *virido-albina* mutants grown in the field or phytotron was similar to that of normal individuals; the respiration rate before treatment was about half that of normal plants but the rate in the recovered plants was somewhat higher than in the normal ones.

393 TUŠNJAKOVA, M. M.
(New techniques in changing spring into winter wheats).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1955 : No. 22 : 95–103. [Russian].

Changes of a soft spring wheat of var. *graecum* into a soft winter wheat of var. *erythrospermum* and of a spring form of var. *lutescens* into winter forms of vars. *lutescens* or *erythrospermum* are reported from the Institute of Genetics. The customary Mičurinist method of shattering the heritable basis of the material by late sowing was modified to ensure a greater percentage of survival of the plants in the autumn and spring. This was achieved by training the material in boxes buried under the snow or kept on ice over the winter or alternatively by training the plants in a glasshouse. In the latter case the change of habit occurred in the first year.

394 KARAPETJAN, V. K.
(New facts on the origin of species in plants).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1955 : No. 22 : 121–36. [Russian].

Conversions of 28 chromosome hard wheats into soft wheats with 48 chromosomes are reported from Gorki Leninskie, after the hard wheats Hordeiforme 1426/7, Arandany, Zarda, Sary-Bugda [Yellow wheat] and Palestine 6 had been sown in late autumn for three generations. Morphological descriptions of *Triticum vulgare* forms obtained in each case are given and the evidence is discussed from the viewpoint of Lysenko's conversion theory, as are also obervations in Italy by Josa and Grifoni on occurrence of soft wheat forms in *T. durum* 'Cappelli' (cf. *PBA*, XVIII, Abst. 2181 and XIX, Abst. 2484).

395 SIMON, M.
Les nouvelles variétés de blé tendre inscrites au catalogue des espèces et variétés depuis 1947. **(The new varieties of soft wheat inscribed in the catalogue of species and varieties since 1947).**
Inst. Nat. Rech. Agron. undated : Pp. 137.

Descriptions of the morphological and physiological characteristics of the 41 new varieties of soft wheat approved for cultivation in France since 1947 are provided. A diagnostic key to the varieties is followed by tabular descriptions of each one, giving its origin, producer, morphological characteristics of the ear and growing plant and data on yield, baking quality, disease resistance, earliness, tillering, degree of resistance to frost and region of adaptation. An alphabetical index to the varieties described is provided.

396 FAVILLI, R.
Aspetti e problemi della granicoltura sarda. **(Aspects and problems of wheat growing in Sardinia).**
Ann. Fac. Agr. Pisa 1955 : **16** : 81–144.

In a general account of wheat growing in Sardinia some information is given concerning the varieties grown. The most popular varieties are Cappelli and Dauno III of *Triticum durum* but a number of others are indicated as having given promising results in recent tests. There are also many local races, which are of interest because of their adaptation to conditions of low rainfall and soil fertility; some of them, such as Murru, Canu Bascia, Biancu [White] and Arrubiu have proved capable of competing with the pedigree varieties in yielding capacity. A collection of the local races from all parts of Sardinia was found to contain some 55 different types, mostly belonging to *T. durum* but some to *T. vulgare* too. Data on their milling and baking quality show that some of the local wheats are superior in respect of extraction percentage and gluten content, whilst in gluten quality they are not inferior to the pedigree varieties.

397 SCHIEMANN, E.
New dates for recent cultivation of *Triticum monococcum* and *Triticum dicoccum* in Jugoslavia.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 1–3.

Information is given on the localities and conditions of cultivation of Einkorn and Emmer and on the uses of these wheats in Yugoslavia. The species show some variability in ear density and colour.

398 MATSUMURA, S.
Chromosome aberrations in Einkorn wheat induced by radiations.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 10–11.

It is noted that marked differences were found between the effects of exposure to X and γ rays upon germination rate and frequency of chromosome aberrations in *Triticum monococcum*, the effects of γ rays being more severe than those of X rays (cf. *PBA*, XXVI, Abst. 2198).

399 UNRAU, J. & KUSPIRA, J.
Development of the aneuploid series and whole chromosome substitution lines in the varieties Thatcher and Lemhi.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 7–8.

In trials for three years at the University of Alberta, lines of Chinese Spring with chromosomes substituted from the donor varieties Timstein, Thatcher and Hope have shown marked differences in such characters as yield, lodging, resistance, earliness and protein content (cf. *PBA*, XXV, Abst. 812). Reciprocal substitution lines of Thatcher and Lemhi are being developed for the purpose of investigating the effects of individual chromosomes. Lines of Thatcher and Lemhi with chromosome XX substituted from McMurachy are being produced; this chromosome bears the gene for resistance to race 15B of stem rust. Chromosome X in Timstein carries two genes for resistance to a number of stem-rust races and is being substituted for the homologous chromosome in Lemhi and Thatcher. When substitution is complete, the lines within either variety are to be combined. Chromosome IX of the winter wheat Kharkov MC_{22} is being substituted for the corresponding chromosome in Thatcher, which is known to carry a gene or genes for winter growth habit in XVIII, the factor or factors for spring habit in IX apparently being epistatic to those in XVIII. The substitution line for IX is expected to have a winter habit. In the hope of securing greater earliness in Thatcher, chromosome XVIII is to be replaced by XVIII from the very early variety Prelude.

400 UCHIKAWA, I.
Misdivisions and non-disjunctions of the C chromosome in β-series speltoid wheat.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 9–10.

The frequencies of misdivision and nondisjunction of chromosome C during meiosis in the progenies of β het speltoids and type 1 subcompactoids are given. For the speltoid material the frequencies were: misdivision at telophase I, 2·13%; misdivision at telophase II, 13·04%; nondisjunction at telophase I, 3·80%; and nondisjunction at telophase II, 12·63%. The respective percentages for the progeny of subcompactoid type were 2·14, 13·12, 3·90 and 13·26. Misdivision and nondisjunction of C in the pollen mother cells of β het speltoids are regarded as being mainly responsible for the C series of speltoids and various types of compactoids.

401 YAMASHITA, K.
Synthesis of a permanent RT-heterozygote in Einkorn wheats.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 12–13.

The author refers to his investigations on X-ray-induced reciprocal translocations in *Triticum aegilopoides* and *T. monococcum* (cf. *PBA*, XXIV, Abst. 2828).

The induced genic mutations *lethal*-1 and *lethal*-2 have been located on chromosomes d and f respectively; the breeding procedure now being used to combine these genes into a ring complex is briefly indicated.

402 OKAMOTO, M. & SEARS, E. R.
Structural relationships between non-homologous chromosomes.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 6.

When haploid plants of the wheat Chinese Spring were pollinated by normal $2n$ plants of the variety at the University of Missouri, 15 reciprocal-translocation lines were obtained. Since these translocations presumably resulted from crossing over between homologous regions of nonhomologous chromosomes in the haploids, identification of the chromosomes involved in the translocations will elucidate structural relationships. An analysis is being made by crossing each translocation line with 21 different nullisomic or monosomic stocks. Of the translocations so far analysed, two involve chromosomes VI and XIX. Three involve homeologous chromosomes and four are between nonhomeologous ones. Chromosome VI enters into four of the translocations.

403 CROSBY, A.
Nucleolar activity of lagging chromosomes in wheat.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 6–7.

Monosomic stocks make possible the examination of large numbers of micronuclei involving any chromosome or arm desired, since each monosomic produces a high percentage of laggards at telophase, some of which form micronuclei. In investigations at the University of Missouri, iso-X^R (isochromosome for right arm of chromosome X), telo-X^R, normal X and normal I had a small nucleolus in 36·9, 24·7, 17·8 and 17·1% of their respective micronuclei. D-genome monosomics had 0–0·8% nucleolar micronuclei with the exception of mono-XVIII, with 5·5%. Only micronuclei containing nucleolar chromosomes may therefore form nucleoli. Observations at diakinesis confirmed the nucleolar-organizing abilities of I, X and XVIII. No relationship was detected between the nucleolus and appearance and disappearance of the matrix.

404 ŽEBRAK, A. R.
(Sesquidiploid hybrids of hard wheats).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1948 : **60** : 669–72. [Russian].

At Moscow, amphidiploids of *Triticum durum* var. *hordeiforme* x *T. timopheevi* were crossed with *T. durum* and gave rise to sesquidiploid hybrids distinguished from the amphidiploid parent mainly by reduced fertility. This was manifest in a reduction in the number of grains and spikelets formed in the ear and in the number of grains per spikelet and per plant. The hybrids had 37, 38 and 40–41 chromosomes instead of the expected 42. This suggests that irregular reduction division and partial elimination of some chromosomes occurred in the amphidiploid parent. The relations between the dominant gene for pubescent empty glumes of *T. timopheevi* and the corresponding recessive genes of *T. durum* var. *hordeiforme* in the amphidiploid and the sesquidiploid are discussed.

405 Žebrak, A. R.
(Sesquidiploids of soft wheat).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1948 : **60** : 1253–56. [Russian].

Sesquidiploids E27 and E31, obtained by crossing the F$_5$ amphidiploids of *Triticum vulgare* x *T. timopheevi* with *T. vulgare* var. *lutescens*, are described. E27 was derived from an amphidiploid involving a *lutescens* and E31 an *erythrospermum* variety of soft wheat. The differences between the genetical constitutions of the amphidiploids and the sesquidiploids are discussed, especially in relation to the inheritance of compact ear, pubescence of empty glumes and awn habit. The sesquidiploids were distinguished from the amphidiploids by reduced fertility, which is attributed to their less stable hereditary basis. They had 47, 49, 50, 51, 53 and up to 56 chromosomes, instead of the expected 56. This is regarded as evidence that partial elimination of some of the chromosomes of the amphidiploids had occurred in the later generations.

406 Ono, H.
Right- and left-handedness in *Triticum* and *Aegilops*. III. The effects of external factors.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 17–19.

The value $\bar{C}$ (cf. *PBA*, XXVI, Absts. 2210–11) was significantly reduced as the nutrient supply under conditions of sand culture decreased. X irradiation of the seedlings caused an even greater reduction, the effect of the treatment upon $\bar{C}$ being transmitted to succeeding generations, as the result, according to preliminary investigations, of the inheritance of genic mutation.

407 Šulyndin, A. F. & Manzjuk, V. T.
(The length of the growth period in a number of hard spring wheat hybrids in relation to cultural conditions).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 6 : 10–14. [Russian].

Earliness predominated in the F$_1$ of hybrids between hard spring wheat x *Triticum turgidum*, whether the plants were raised under irrigation or rainfed conditions at Harjkov. The F$_2$ resembled the early parent when grown under rainfed conditions, but reached maturity a little later when grown under irrigation. The succeeding generations of the plants, well supplied with nutrients and moisture, tillered and eared more intensely and passed earlier through the tillering and earing stages than the plants from which nutrients and moisture had been witheld.

408 Varenica, E. T.
(Breeding winter wheat by hybridization using the method of selective fertilization).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 1 : 21–29. [Russian].

Nemčinovka 15 and Nemčinovka 45 were bred in Moscow province. They were obtained by open pollination of Erythrospermum 15 and Lutescens 17, which are both from Verhnjačka, with Uljjanovka, Lutescens 329, Erythrospermum 917, Petrovskaja 7 and other good winter-hardy varieties. The new varieties outyield the standard Hybrid 599, have larger grain and ripen earlier. They are also notable for productive ears, good tillering, lodging resistance and winter hardiness.

409 Ukolov, A. A.
(A hard form of winter wheat).
Dokl. Akad. seljskohozjaĭstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1956 : No. 5 : 6–7. [Russian].

Hordeiforme 471 was obtained by first open pollinating a *Triticum turgidum* variety with several soft winter wheats and then by supplementary pollination with the pollen of another *T. turgidum* form. This 28 chromosome wheat from the Timirjazev Agricultural Academy has a more productive ear than the standard Moscow 2453, which it also surpasses in grain quality, 91·75% of the grains being rated as vitreous. The 1000 grain weight is 44·94 g. The respective values of Moscow 2453 are 77·20% and 33·98 g. The new wheat is 10–12% less winter-hardy than the standard but it is less liable to lodge than the soft wheat varieties.

410 Medvedeva, G. B.
(The effect of pollination with a small amount of pollen upon variability in wheat hybrids).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1955 : No. 22 : 83–94. [Russian].

The hybrids of Hordeiforme 432 ♀ x Mutico-Valencia 89 ♂ and Albidum 26805 ♀ (*Triticum vulgare*) x Kahetia ♂ (*T. turgidum*) gave less vigorous progenies when fertilized by a small than by a large amount of pollen at Gorki Leninskie. Hybrids obtained by the first method were characterized by greater variability with regard to quantitative characters.

411 FEDOROV, A. K.
(The effect of light during the autumn period upon branching and productivity of the ear).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1955 : No. 22 : 116–20. [Russian].

The relation between the date of sowing of F_6 and F_7 hybrids of *Triticum turgidum* x *T. vulgare* on the one hand and the branching and productivity of the ear on the other has been investigated.

412 ALBO, G.
Buoni grani duri. **(Good hard wheats).**
G. Agric. Domen. 1956 : **66** : p. 320.

A hard wheat with branched ears called *Triticum ramosum* var. *hyblaeum* has been produced at the Modica research station, Sicily. Yields over 56–89 per ha. are claimed.

413 KRUSTENJ, A.
(Wheat with branched ears).
Augsne un Raža 1956 : No. 5 : 157–68. [Russian].

Material with branched ears tested in Latvia included the F_5 and F_6 of *Triticum vulgare* x *T. turgidum* from Gorki Leninskie. These produced long branching ears with up to 150 grains each. The 1000-grain weight was 40–60 g. The yield, calculated on the basis of a small plot, was 49·8 c. per ha. Forms distinguished by hardiness and resistance to fungi were selected. Ostka [Awned] and other winter wheats with normal ears from Priekuli were induced to form branched ears by transferring the plants to rich soil at the tillering stage. In the first year many Ostka plants bore ears that had up to 60 grains each and weighed 2·5 g. The succeeding generation was afforded the same treatment, to which it responded by a further increase of grain yield per ear. The most productive ears bore 110 grains and weighed 5 g. each. The quality of the grain was good and the 1000 grain weight was 40–45 g.

414 YAMASHITA, K., TANAKA, M. & KOYAMA, M.
Studies on the quality of *Triticum* and *Aegilops*.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 13.

T. vulgare, *T. monococcum*, *T. dicoccum*, *T. spelta*, a synthesized hexaploid wheat and *Ae. squarrosa* were analysed with respect to protein, ash, absorption and gluten percentages and loaf volume. The taste of the loaf made with *Ae. squarrosa* flour is described as good although in appearance the loaf was inferior to that baked with *T. vulgare* flour.

415 **1955 Report of the Grain Research Laboratory, Board of Grain Commissioners for Canada, Winnipeg, Manitoba 1956** : Pp. 77.

Wheat. On the basis of three-years tests in respect of milling and baking qualities, CT422 was classed as equal in quality to Marquis. After two-years tests CT198 and CT317 were also considered equal to Marquis. DT209, an amber durum wheat, was classed as equal in quality to Mindum after three-years tests. Bread and durum wheats from many other countries were compared with Canadian varieties.

Barley. Promising malting quality was shown by Br 3833 and 3878 and UM 584 and 1623 on the basis of two-years tests, and by Br3902 after one-year tests. Studies made of New Zealand varieties showed that Research, selected for its agronomic qualities, is superior in malting quality to Kenya.

416 **The flour strength of wheat varieties.**
J. Agric. W. Aust. 1956 : **5** : p. 310.

Some sixty wheat varieties grown in Western Australia are divided into four groups, strong, medium-strong, weak and very weak, on the basis of flour strength. Charter, Festival and Yalta are the only three varieties in the first group but most of the 19 varieties in the second group are capable of producing premium grade flour when grown under suitable soil and climatic conditions.

417 HARRIS, R. H. & SIBBITT, L. D.
Relations between wheat protein content, loaf volume, expansion volume, and sedimentation value. II. Samples delineated by particle size.
Cereal Chem. 1956 : **33** : 273–75.

In a previous paper the author concluded that determinations of expansion volume and sedimentation value may be useful as supplementary information to that furnished by protein analysis in evaluating hybrids of very diverse quality but not in the preliminary screening of samples of generally superior quality (cf. *PBA*, XXVI, 2175). Analysis of two series of composite flours, with a range in particle size, milled from hard red spring wheats and Mexican wheats respectively, confirmed this conclusion.

418 Winterweizensorten für Niederösterreich. **(Winter wheat varieties for Lower Austria).**
Landwirtschaft 1956 : **17** : p. 3.

The importance of combining productivity with good quality of grain is emphasized. Austrian varieties possessing both these characters are Stamm 101 [Strain 101], Harrach-Weizen [Harrach wheat] and Drauhofner Kolben [Drauhofen Club], all of which are new varieties recently released for general cultivation. Of the older, established varieties, Austro Bankut and Tassilo are the most widely grown in Lower Austria; Austro Bankut is still satisfactory as regards yield and quality but the cultivation of Tassilo should be discouraged.

419 Pollhamer, E.
Minőség kérdése a búzanemesítésben. (**The question of quality in wheat breeding**).
Martonvásár. növényterm. Kutató Int. Évkön. 1950 (1952) : **1** : 113–24.

Of 50 wheat varieties tested for quality at Martonvásár, Hungary, and graded according to a new scale based on laborograph values, 12 were sufficiently high in quality to be of promise for further breeding.

420 Kihara, H. & Yamashita, K.
A summary of the results of the Kyoto University Scientific Expedition to the Karakoram and Hindukush May-August, 1955.
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 32–35.

The report includes information on the number of collections of cereal and grass species obtained and their localities. *Aegilops squarrosa* var. *typica* was widely distributed, usually in association with cultivated wheat. *Ae. squarrosa* var. *strangulata* was however found only in a restricted area in Gorgan, Iran. It is stated that the first author has confirmed his theory that *T. vulgare* originated in the Caucasus through hybridization between Emmer wheat and *Ae. squarrosa*.

421 Jolivet, E.
Fertilisation azotée du blé d'hiver. II. Utilisation à des fins différentes de l'azote épandu semi-tardivement sur deux variétés distinctes. (**Nitrogen manuring of winter wheat. II. Utilization to different ends of nitrogen spread moderately late on two distinct varieties**).
CR Acad. Agric. Fr. 1956 : **42** : 486–90.

When the amount of nitrogen available to the plants was insufficient, Capelle utilized it primarily to form grain and Progress to produce straw. Only when the fertilizer was applied at optimum levels did the former variety give its maximum yield of straw and the latter its maximum yield of grain.

422 Sakai, K.
Studies on competition in plants. I. Analysis of the competitional variance in mixed plant populations.
Jap. J. Bot. 1953 : **14** : 161–68.

The effect of intergenotypic competition was studied in mixed sowings involving the varieties Kojimawase [Kojima Early], Norin 26 [Ministry of Agriculture and Forestry 26] and Norin 30. When the variance was partitioned into genetic, environmental and competitive components, the variance due to competition ranged from ca. 0 to 40%. It therefore appears that biometrical genetical studies that ignore the possible effects of intergenotypic competition may be seriously at fault.

423 Vallega, J.
Incorporación de factores de resistencia a las enfermedades en los trigos cultivados. (**Incorporation of factors for resistance to diseases in cultivated wheats**).
Idia 1956 : No. 100 : 1–6.

Argentine plans for breeding wheat for disease resistance are reviewed in general terms. Among the topics touched upon are changes in physiological races of pathogens, the use of genetically heterogeneous resistant populations and methods of increasing the number of generations per year of breeding material.

424 Jannaccone, A.
I frumenti duri e la valutazione della "stretta". (**Hard wheats and the assessment of scorching**).
Ital. agric. 1956 : **93** : 509–17.

The effects of scorching were measured on a number of varieties of *Triticum durum* grown in Sicily, using the method proposed by R. Chevalier (cf. *PBA*, XXIV, Abst. 1859). The preliminary results indicate that the varieties Garigliano and Russello are less susceptible to the effects of high temperatures than Cappelli and Timilia.

425 Asana, R. D., Mani, V. S., Pillay, K. P. & Gahlot, K. N. S.
Analysis of drought resistance in crop plants. I. The influence of soil-drought on the relation between yield and ear characters in wheat (pot-culture).
Indian J. Genet. 1955 : **15** : 59–79.

With the object of selecting a relatively simple index of drought resistance, physiological characters influencing yield both under conditions of adequate soil moisture and under drought conditions were investigated in pot experiments at the Indian Agricultural Research Institute, New Delhi. In the 17 varieties tested, ear number was by far the most important yield component under conditions of adequate soil moisture but, under drought conditions, grain number per ear was as important a factor as ear number. Varietal differences in respect of 1000-grain weight were more consistent than in respect of ear number or number of grains per ear when plants grown under conditions of adequate moisture were compared with those grown under conditions of drought. From the above findings it is concluded that emphasis should be laid on number of grains per ear, ear number and 1000-grain weight in selecting strains capable of giving high yields on non-irrigated land in northern India; early maturity is also of considerable importance. Negative associations were established in the above experiments between early maturity and high number of ears, between number of grains per ear and high 1000-grain weight and between number of grains per ear and number of ears per plant: the main reason that none of the varieties studied was completely satisfactory under drought conditions was their inadequacy in respect of one or more of these characters. In the opinion of the authors, however, it should prove possible to break these negative associations by selection.

426 ABDUL GHAFOOR KAUSAR
Plant diseases in relation to improvement of wheat in Pakistan.
Agriculture, Pakistan 1955 (1956) : **6** : No. 3 : 41–46.

A short survey is presented of the most important fungous diseases occurring in Pakistan and of the progress that had been achieved in breeding improved resistant varieties before Partition.

427 PROVAGLIO, L.
Nero dei cereali, Fusarium e mal del piede. (**Black mould of cereals, *Fusarium* and foot rot**).
Sementi elette 1956 : **2** : No. 6 : 40–42.

The Italian wheat varieties Mara and Impeto have remained free of infection by black mould (*Mycosphaerella tulasnei*).

428 IKEDA, T., HIGASHI, S. & ONO, S.
(**Studies on the resistance of cereal varieties to *Gibberella saubinetii*. III. Varietal differences in the enlargement of the lesions due to *G. saubinetii*.**
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1955 : No. 2 : 69–75. [Japanese].

Continuing the studies summarized in *PBA*, XXV, Abst. 1823, the authors examined the association between rate of enlargement of lesions in a series of Japanese wheat varieties and various characteristics of the spikelet. Resistance, characterized by slow rate of lesion growth, was associated with reduction in the amount of parenchyma on the inner side of the lemma, smaller and thicker epidermal cells on the inside of the lemma, and a lower content of water and sugars in the glumes.

429 NAKAGAWA, M.
(**Studies on the resistance of wheat varieties to *Gibberella saubinetii*. V. The relation between susceptibility to *G. saubinetii*, injury by potassium chlorate to the seedlings, and fructose content**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **5** : 275–77. [Japanese].

Using the same seven varieties as in earlier studies, the author shows that gene *A* for resistance to the above pathogen also conditions susceptibility to the toxic action of $KClO_3$ (cf. *PBA*, XXVI, Abst. 1175). Plants carrying *A* have relatively high contents of fructose in the grain and seedling.

430 NAKAGAWA, M.
(**Studies on the resistance of wheat varieties to *Gibberella saubinetii*. VI. The relation between susceptibility to *G. saubinetii*, rate of decolorization of Methylene Blue, and glucose content**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **5** : 278–80. [Japanese].

Pursuing a similar line of research to that summarized in Abst. 429, the author established a positive correlation between the presence of gene *B* for resistance to *G. saubinetii* and high rate of decolorization of Methylene Blue. Varieties carrying *B* have a relatively high glucose content.

431 ZSCHEILE, F. B.
Suppression of bunt-resistant gene action by environmental conditions.
Proc. nat. Acad. Sci. USA 1956 : **42** : 340–47.

In investigations at the University of California, Davis, the action of the Martin gene for resistance to bunt (*Tilletia caries*) was suppressed in six pairs of wheat varieties essentially isogenic except for this gene, when the plants were subjected to low temperature during the whole of the life cycle, combined with treatment with fluorescent or incandescent light. The susceptible varieties were 100% infected, and their counterparts, normally considered almost 100% resistant, showed an appreciable amount of infection.

432 Holton, C. S., Vogel, O. A., Kendrick, E. L. & Elliott, F. C.
The reaction of varieties and hybrid selections of wheat to physiologic races of *Tilletia caries* and *T. foetida.*
Agron. J. 1956 : **48** : 276–78.

Seventy-seven wheats tested for reaction to 16 races of *T. caries* and nine of *T. foetida* fell into the following groups: I, highly susceptible to all races; II, carrying the Martin gene for resistance to about half of the races; IIA, IIB and IIC, similar in reaction type to II but each carrying a different factor; III, carrying the Turkey gene for a high degree of resistance to all races except T–16 and L–8; IIIA, similar to III but only moderately susceptible to T–16 and L–8; IIIB, similar to III but resistant to L–8; IV, wheat x *Agropyron* derivatives showing the Ridit reaction, characterized by resistance to all races except T–11, T–13, L–9 and L–10; IVA, similar to IV but resistant to L–10 and susceptible to some additional T races; V, similar in reaction to Hohenheimer; VI, resistant to all races but showing more than 1% infection with some races; and VIA, highly resistant to all races. The eight varieties found in group VIA are: hybrids of 27–15 with Rio–Rex-53, Rio–Rex–41, Rio–Rex–10–1 and Rio–Rex–74; Utah 175a–53; two hybrids from the cross Elgin 19 x Elmar; and the newly released variety Omar.

433 Grasso, V.
Ricerche preliminari sulla genetica di una collezione di carie del grano, proveniente da Noto (Siracusa). [**Preliminary researches on the genetics of a collection of wheat smuts orginating from Noto (Syracuse)**].
Boll. Staz. Pat. veg. Roma 1955 (1956) : **13** : 217–27.

The observations reported establish the existence of two sexual groups in the collection of *Tilletia* sp. concerned.

434 Swanson, A. F.
Research, production, importation and utilization of wheat in Peru.
Spec. Rep. Progr. Coop. Exp. Agropec., Lima 1956 : No. 1 : Pp. 28. (Mimeographed).

The report includes a section dealing with breeding at the Junín and La Molina stations, participation in the International Rust Nursery scheme, old and new varieties, and methods of distribution of pure seed stocks. The following improved varieties outyield the Chumpi type (*Triticum durum*) and introductions such as Marquis and Florence x Aurore by at least 20%: Galgalos x Kenya 883–3; Galgalos x CAJ1324–1; Galgalos x Kenya 804–2; Yamalan (Reward H–4424–716 x Rhodesian CI2273); Marina (María Escobar x NA101.11.3.42,3–15); Mariachi and Helvia, both from María Escobar x H44–Marquis; and Neo Maribal (María Escobar x Baladi [Local]). These wheats owe their superiority in yield to better resistance to rust, greater inherent yielding ability and improvement in lodging resistance and other properties; some of them are already being grown commercially.

435 Pugsley, A. T.
The gene Sr Ka 1 in relation to the resistance of wheat to *Puccinia graminis tritici.*
Emp. J. exp. Agric. 1956 : **24** : 178–84.

Investigations initiated at the Waite Agricultural Research Institute in South Australia and continued at Wagga, NSW, indicated that 15 varieties in current use by breeders have a gene (*Sr Ka* 1) in common for resistance to the Australian race 222 Anz 2 of *P. graminis* var. *tritici*. This gene is also effective in controlling race 126 Anz 1 in Australia; it is however ineffective against race 126 Anz 2. The three other varieties studied, Kenya B286, Kenya 338AC2E2 and Kenya 321BT1B1, each possessed a particular type of resistance to race 222 Anz 2 distinct from that shown by the first-mentioned group of varieties. Investigations reported by other workers on the varieties included in the first group, e.g. Kenya 112A, Kenya NB263J(L), Kenya 130B6B, McMurachy and Onas 52, suggest that *Sr Ka* 1 also confers resistance to a number of races, including 15B, in other countries. A plea is made for the establishment of an internationally recognized centre vested with the responsibility of maintaining authentic type material of known genetic constitution. With such a centre, existing knowledge on sources of rust resistance could be systematized and future breeding work planned more effectively.

436 Basile, R.
Alcune razze fisiologiche di *Puccinia graminis tritici* Erikss. et Henn. della Grecia. (**Some physiological races of *P. graminis tritici* Erikss. et Henn. from Greece**).
Boll. Staz. Pat. veg. Roma 1955 (1956) : **13** : 137–40.

The races detected comprised race 34, 16 and a new race referred to provisionally as N.

437 Vasudeva, R. S.

News from India. Yellow rust of wheat (*Puccinia glumarum*).

Commonw. Phytopath. News 1956 : **2** : p. 44.

A widespread outbreak of yellow rust on the wheat crop in northern India during 1955–56 is reported. NP710 was very little infected, but C250, C228, C281, C518 and NP718, previously only slightly infected, were severely affected. Race A of the rust was predominant.

438 Abdus Sattar & Abdul Hafiz

Wheat rusts in West Pakistan.

Agriculture, Pakistan 1955 (1956) : **6** : No. 4 : 52–63.

This article includes a list of the races of black, brown and yellow rusts prevalent in West Pakistan and a table showing the rust reactions of 184 FAO wheat varieties tested at three localities; a number proved resistant to all three species and may prove of use in breeding.

439 Knott, D. R. & Anderson, R. G.

The inheritance of rust resistance. I. The inheritance of stem rust resistance in ten varieties of common wheat.

Canad. J. agric. Sci. 1956 : **36** : 174–95.

Rust tests carried out on F_2 populations from diallel crosses and on families from back crosses to the susceptible variety Marquis allowed the following genes for resistance to stem rust races 15B and 56 to be identified in the nine resistant wheats studied: (1) a dominant gene, designated *Sr*6, governing a hypersensitive reaction to both races in Kenya 58, Red Egyptian and McMurachy; (2) a partially dominant gene *Sr*7 for resistance to race 15B in Kenya 58, Kenya 117A and Egypt Na95; (3) a partially dominant gene *Sr*8 conferring moderate resistance to both races in Red Egyptian; (4) an incompletely dominant gene *Sr*9 governing moderate resistance to race 56 in Red Egyptian, Kenya 117A and Egypt Na95; (5) a partially dominant gene *Sr*10 determining resistance to race 56 in Kenya 117A and Egypt Na95; and (6) two dominant complementary genes, *Sr*11 and *Sr*12, controlling resistance to race 56 in Timstein, Gabo and Lee. No genetic analysis of Thatcher was made but this variety appears to carry at least three factors controlling resistance to race 56 and has no resistance genes in common with any of the other varieties.

440 Athwal, D. S.

The resistance of some wheat varieties to physiologic race 42 of *Puccinia graminis tritici.*

Indian J. Genet. 1955 : **15** : 80–87.

The mode of inheritance of seedling reaction to race 42 of Indian origin was studied in the Australian varieties Eureka 1325, Bencubbin 1099 and Dundee 985, in the Italian variety Mentana 1124 and in Uruguay 1064, imported into India from Uruguay as a source of resistance to leaf rust. Crosses were effected both among the above resistant varieties and between them and the susceptible varieties Federation 107, Quadrant 1526, Pusa 4W165 and Chinese White; in addition, crosses involving the resistant varieties Kenya 117A and Gabo were carried out (cf. *PBA*, XXIV, Abst. 2854). Most of the genes for resistance to race 42 identified in the above varieties were ineffective against Australian races of the pathogen and against race 21 of Indian origin. It was shown that one major dominant gene controls resistance to race 42 in Eureka, Bencubbin, Mentana, Dundee and Uruguay; the presence of intermediate types of reaction is attributed to the action of modifying genes. The single factors determining resistance in Eureka and Bencubbin are allelic and distinct from the single factor controlling resistance in Mentana and from the two factors in Gabo. The single factors in Eureka, Bencubbin and Uruguay are all allelic to one of the two factors in Kenya 117A. The factor for resistance in Mentana is inherited independently of the genetical factors in Gabo and Kenya 117A. A study of the cross Federation x Eureka showed that the factor for resistance to race 42 in Eureka, which is effective only at temperatures below 65° F., is quite independent of another factor in this variety controlling resistance to race 21.

441 Hashim, M.

Inheritance of leaf rust reaction in crosses of vulgare wheats.

Proc. Indian Acad. Sci. : Sect. B : 1956 : **44** : 38–46.

Data from the F_2 and F_3 progenies of Frontana x Thatcher agreed satisfactorily with the hypothesis that Frontana carries the factor pair *RR* for seedling resistance to leaf rust race 126 while Thatcher carries the pair *SS* for susceptibility, *S* being epistatic to *R*. Adult resistance in Frontana appeared to be determined by a second, incompletely dominant gene pair, R_2R_2. Adult and seedling reaction were strongly associated and estimations of linkage gave recombination values of 8·25 ± 4·8% between R_2 and R and 22·7 ± 6·4% between R_2 and S, indicating that the three factors are linked.

442 **Test new Lee wheat.**
What's New Crops Soils 1956 : **8** : No. 9 : p. 24.

A line of Lee resistant to race 15B of stem rust has been developed by irradiation of the parent variety in an atomic pile. The line is to undergo milling and breadmaking tests at the University of Minnesota.

443 Samborski, D. J. & Shaw, M.
The physiology of host-parasite relations. II. The effect of *Puccinia graminis tritici* Eriks. and Henn. on the respiration of the first leaf of resistant and susceptible species of wheat.
Canad. J. Bot. 1956 : **34** : 601–19.

Heavy inoculation of the susceptible wheat *Triticum compactum* 'Little Club' was followed by a large increase in the dry weight of the inoculated leaves accompanied by an O_2 consumption per unit dry weight or per unit of tissue nitrogen 2·5–3 times as great as for healthy tissues; nitrogen content remained close to that of uninfected leaves. Inoculated leaves of the resistant variety *T. dicoccum* 'Khapli,' on the other hand, showed a rapid decline in dry weight and nitrogen content and the rate of oxygen consumption rose more quickly and declined again sooner than in Little Club.

444 **Wheat resists greenbugs.**
What's New Crops Soils 1956 : **8** : No. 8 : p. 32.

A red-grained spring wheat, CI9058, from the world collection of the US Department of Agriculture has shown resistance to *Toxoptera graminum* in greenhouse tests.

445 Tsuchiya, T.
Hybrids between *Aegilops triaristata* (4*x*) and *Ae. comosa, Heldreichii* and *uniaristata.*
Wheat Inform. Serv. Kyoto 1956 : No. 3 : 22–23.

A brief report is given of the results of crossing 4*x* and 6*x* *Ae. triaristata* as ♀ with *Ae. comosa* and *Ae. uniaristata*, and 6*x* *Ae. triaristata* ♀ with *Ae. heldreichii*. One hybrid ($2n = 21$) obtained from *Ae. triaristata* (4*x*) x *Ae. comosa* is described. It was morphologically intermediate between its two parents and completely sterile.

446 McGinnis, R. C.
Genome analysis of *Aegilops juvenalis.*
Canad. J. agric. Sci. 1956 : **36** : 284–91.

A study of meiotic pairing in 13 interspecific and intergeneric hybrids involving three species of *Triticum* and five of *Aegilops* indicated that one of the genomes of the hexaploid *Ae. juvenalis* is closely similar to the D genome of *T. vulgare* and that another is homologous with the C^u genome in *Ae. ovata* and *Ae. variabilis*. The crosses studied provided no definite evidence regarding the identity of the third genome.

447 Tanaka, M.
Spring- and winter-growing habit in *Aegilops squarrosa* var. *typica.*
Wheat Inform. Serv. Kyoto 1956 : No. 3 : p. 22.

Generally speaking, the wild forms of *Aegilops* and *Triticum* have a winter habit; such a habit may therefore be postulated as belonging to the ancestral type in the two genera. A strain of *Ae. squarrosa* var. *typica* from Quetta, Pakistan, has however shown a spring habit.

OATS

448 **Cup for Powys oats.**
Agric. Merch. 1956 : **36** : No. 8 : p. 67.

The new winter oat Powys, from the cross S147 x S172, combines the high yielding capacity of the former parent with the short, stiff straw of the latter. Developed at the Welsh Plant Breeding Station, Aberystwyth, it was previously known as Hybrid 7.

449 Eikeland, H. J.
Forsøk med havresortar 1950–54. **(Trials of oat varieties, 1950-54).**
Forskn. Fors. Landbr. 1956 : **7** : 317–51.

Details are given of the yield, length of growth period, lodging and quality of oat varieties grown at seven stations in Norway. Notes are given on each variety and on the basis of the trial results, recommendations are made regarding the choice of varieties for the various districts. Sisu, Blenda and Sol II [Sun II] were the best late varieties; Blixt [Lightning], Strind and Bambu were best where the temperature during the growing season was lower; and Voll, Hein II and Nidar II were best suited to districts with a short growing season.

450 **A new oat for South Arkansas.**
Arkans. Fm. Res. 1956 : **5** : No. 2 : p. 5.

Ferguson 560, hitherto designated CI7161, is a selection from Ferguson obtained at the Agronomy Department of the Arkansas Agricultural Experiment Station. It is resistant to rust, gives yields slightly higher than those of Ferguson 922 and its straw is approximately 2 in. shorter than that of Ferguson 922. Its grain is similar to that of other varieties of the Red Rustproof type.

451 **Centore, new spring oat, scores in central Oregon.**
Fm. Mgmt. 1956 : **5** : No. 7 : p. 35.

Developed from Victoria-Richland x Bannock and particularly suitable for growing on irrigated farms in central Oregon, Centore is high yielding, strong strawed and resistant to some races of smut, stem rust and crown rust.

452 PEARSON, F. B. & JUDD, P.
Oat varieties for grazing hay grain.
J. Dep. Agric. S. Aust. 1956 : **59** : 425–29, 447.

The question as to which varieties to grow in South Australia is discussed and descriptions of 18 of the most common varieties cultivated in that area are given. In recent years Early Kherson has increased in popularity at the expense of Fulghum and Algerian, and Orient and Ballidu have tended gradually to displace Mulga, Early Burt and Algeribee. Fulmark, a new variety issued by the New South Wales Department of Agriculture in 1955, is described as a widely adaptable oat that tillers well and produces strong, erect foliage well suited for grazing purposes. There is good recovery after early grazings, when the plant produces high yields of large, plump grain of excellent quality.

453 ROSEN, H. R.
Variations in Arkwin and Traveler oats.
Arkans. Fm. Res. 1956 : **5** : No. 2 : p. 7.

Morphological variants in the above varieties are described to enable farmers to distinguish between the occurrence of true offtypes and the presence of seeds of other varieties. Attempts have been made to select pure strains without variants but such strains have always proved inferior in disease resistance, particularly in resistance to smut.

454 GRIFFITHS, D. J. & JOHNSTON, T. D.
Origin of the common wild oat, *Avena fatua.*
Nature, Lond. 1956 : **178** : 99–100.

Fertile and completely sterile fatuoids were induced by X irradiation of seeds of *A. sterilis* var. *maxima*. The fertile fatuoids closely resembled *A. fatua*, support thus being obtained for Coffman's suggestion that the latter species arose by mutation of *A. sterilis* (cf. *PBA*, Vol. XVII, Abst. 677).

455 SCHLEHUBER, A. M., CURTIS, B. C. & CHATTERS, R. M.
Progeny performance of fluorescence in Andrew oats.
Agron. J. 1956 : **48** : 381–83.

The data given on the classification for reaction to ultraviolet light of successive progenies derived from nonfluorescent and fluorescent seed of Andrew indicated that environmental factors exert a marked influence upon the expression of fluorescence, which may not therefore be regarded as an adequate criterion of varietal identification (cf. *PBA*, XXV, Abst. 251).

456 GERRETSEN, F. C.
Mangaangebrek bij haver in verband met fotosynthese. (**Manganese deficiency in oats in relation to photosynthesis**).
Landbouwk. Tijdschr., 's-Grav. 1956 : **68** : 756–67.

Oats grown in soil with a low manganese content were characterized by a reduction in the rate of photosynthesis and by poor root development. Of some 200 varieties tested at the Soil Research Station, Groningen, Netherlands, a few, such as Ayrline, AA734, Borris opus, Onward and Fyris, proved relatively resistant to conditions of manganese deficiency. The possibility of breeding varieties capable of yielding well on soils poor in manganese is discussed briefly.

457 KIESLING, R. L. & GRAFIUS, J. E.
Several oat varieties resistant to natural infection by *Leptosphaeria avenaria.*
Phytopathology 1956 : **46** : 305–06.

Forty lines showing resistance to *L. avenaria* were selected from among 5343 lines from the USDA world collection and tested under conditions of heavy natural infection in Michigan during 1953–55. Some of the varieties differed in reaction to the black-stem and leaf-blight phases of the disease and there was some variation between different years, but nine varieties, CI 1415, 4890, 5037, 5056, 5156, 5161, 5240, 5260 and 5335, showed high resistance to both phases over the whole period. The resistant lines varied in agronomic characteristics and may prove useful in breeding for resistance in Michigan.

458 WILLIAMS, W. & VERMA, U. N.
Investigations on resistance to disease among species of the genus *Avena*. II. Resistance to physiologic races of *Puccinia coronata avenae* and *Puccinia graminis avenae.*
Ann. appl. Biol. 1956 : **44** : 453–60.

A collection of 53 samples representing both

diploid and tetraploid species of *Avena* was tested under various conditions for reaction to three cultures of crown rust and two of stem rust. Resistance to all three crown rust races occurred only in two samples of the tetraploid *A. strigosa* ssp. *barbata* and only one of these was also resistant to the stem rust cultures. Since this material, although slightly susceptible to mildew, is also highly resistant to both loose and covered smut and shows some compatibility with *A. sativa* and *A. byzantina*, it may prove possible to transfer genes for resistance directly to the cultivated species without the need for synthesizing new amphidiploid bridging hybrids. *A. strigosa* ssp. *strigosa* was slightly less resistant to the two rust species but has a similar range of resistance to other diseases and may also prove to be useful breeding material.
The resistance of Richmond to stem rust broke down at 70° C. and this variety is therefore regarded as unsuitable as a source of resistance genes.

459 SIMONS, M. D.
The genetic basis of the crown rust resistance of the oat variety Ascencao.
Phytopathology 1956 : **46** : 414–16.

Data from crosses of Ascenção with various resistant and susceptible varieties indicate that Ascenção carries both the Victoria gene or gene complex for moderate resistance to available races of *Puccinia coronata* var. *avenae* and susceptibility to *Helminthosporium victoriae* and a further gene, designated *E*, which is epistatic to the Victoria gene with respect to rust reaction and confers crown-rust immunity at the seedling stage under greenhouse conditions. This gene confers a higher degree of resistance than is found in Landhafer, Santa Fe or Trispernia and is apparently not allelic to any of the genes carried by these varieties.

460 HUBER, W.
Nicht alle Hafersorten sind für die Erzielung eines hohen Grünfuttererertrages gleich gut geeignet. (**Not all oat varieties are equally suitable for obtaining a high yield of green fodder**).
Schweiz. landw. Z. 1956 : **84** : 784–85.

Based on trials carried out at Zürich-Oerlikon and other research centres in Switzerland, recommendations are made as to the best varieties of oats to be grown in combination with vetch and other leguminous forage crops. Varieties with a rapid rate of growth in the juvenile stage, such as Flämingsgold, Flämingstreue, Soldanelle and Goldregen [Golden Rain], give the best results and also escape serious damage by the frit fly (cf. *PBA*, XXV, Abst. 256).

RYE

461 Forsøg med Rugsorter 1952–55. (**Trials of rye varieties, 1952-55**).
Tidsskr. Frøavl 1956 : No. 527 : 394–96.

Further results of the trials of which a preliminary report appeared in *PBA*, XXV, Abst. 258, are presented. As before, Sejet Kærneråg [Sejet Kernel rye] gave the highest yields in loamy soils and a Petkus mixture from the breeding plots was the best on sandy soils. Élites of the Svalöf variety Kongsråg II [King's rye II] had the shortest and strongest straw.

462 Winterrogge, 1956. (**Winter rye, 1956**).
Landbouwvoorlichting 13 : Bijl. 12; Ber. Rassenkeuze 1956 : No. 209 : Pp. 3.

The results of trials of eight diploid varieties on different types of soil in the Netherlands are presented, together with brief descriptions of each variety. Dominant, Petkus and CIV4 gave the highest yields of grain on most types of soil and Petkus and CIV4 the highest yields of straw. Brandt's Marienroggen [Maria rye] did well on soils of high fertility, especially marine clay, but was unsatisfactory elsewhere. Heertvelder proved highly resistant to eelworms but gave grain yields 5–8% below those of the most productive varieties; its straw yield, however, was good. Three new tetraploid varieties, Goliath, Tetra and Tetraploïde I.v.P. [Plant Breeding Institute Tetraploid] are also described. The grain yields of these experimental varieties are approximately 5% below those of the principal diploid varieties but they have larger grains and their straw yield is slightly higher.

463 MORRISON, J. W.
Chromosome behaviour and fertility of Tetra Petkus rye.
Canad. J. agric. Sci. 1956 : **36** : 157–65.

Studies of meiotic behaviour in two lots of the autotetraploid Tetra Petkus gave results closely similar to those reported by Müntzing for other tetraploid varieties (cf. *PBA*, XXI, Abst. 1804). The frequency of quadrivalents was high and there was evidence that selection for increased fertility had not been accompanied by an increase in the regularity of pairing. Aneuploids occurred at a frequency of about 15% and were less fertile than the tetraploids. Seed setting was 10% higher in diploid than in tetraploid varieties but showed considerable variation in both types, both between plants and between tillers on the same plant.

464 Sánchez-Monge, E. & Ramírez, D.
La selección de la fertilidad en el centeno. (**Selection of fertility in rye**).
An. Estac. exp. Aula Dei 1956 : **4** : 208–11.

A significant correlation between the amount of seed set under bags and on open pollination was observed in an unselected population of tetraploid rye but the correlation was not significant in the following generation derived from selected plants. It is concluded that in tetraploid rye selection for increased fertility cannot therefore be based on the seed sets obtained from selfing.

465 Miladinović, N.
Broj neoplodjenih cvetova u srednjem delu klasa raži u matičnjaku za odabiranje i uticaj na semensku vrednost superelite. (**The number of unfertilized flowers in the central portion of the rye ear in the seed nursery and its effect upon the seed value of the superélite**).
Arh. poljopr. Nauk. 1955 : **8** : No. 21 : 52–60.

Rye plants sown at 70 x 25 cm. in the nursery at Zaječar were characterized by a longer growth period, greater susceptibility to lodging and less uniform flowering and maturation than more closely spaced material in the field plots. All this had an adverse effect upon pollination and resulted in an increased number of unfertilized flowers in the central portion of the ear. The plants produced seed of an inferior quality.

466 Fadrhons, J.
Šlechtění krátkostébelného žita. (**Breeding a short-strawed rye**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1956 : **29** : 645–52.

At Semčice, a newly bred winter rye Dobrovické Krátkostébelné [Dobrovice Short-strawed] showed a higher degree of resistance to lodging than varieties with a medium or long culm. However, the yield and quality of grain and straw of Dobrovické Krátkostébelné were below those of the others, especially of Českí [Czech], which has a good tillering capacity and straw 131 cm. long.

MAIZE

467 Cosolo, G.
Il Cinquantino monfalconese "Cosolo". (**The Cosolo strain of Cinquantino monfalconese**).
Sementi elette 1956 : **2** : No. 6 : 44–45.

Cinquantino monfalconese is a local maize variety grown in the region around the head of the Adriatic Sea. The author's selection has a shorter vegetative period, higher yield and greater resistance to drought than the unselected population.

468 Kalinin, M. S.
(**Maize varieties in the districts new to its cultivation**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 1 : 45–49. [Russian].

The intervarietal hybrid Bukovina 1 and the top cross Bukovina 2 produced the most grain and forage in a number of nonchernozem districts. Among the other varieties tested the late-ripening Sterling, Partizanka and Krasnodar 1/49 were distinguished by high forage yields, but none of these produced grain.

469 **Corn variety tests at 10 locations.**
Miss. Fm. Res. 1956 : **19** : No. 1 : 4–5.

As a result of trials at ten localities varieties are recommended for growing in the three regions of Mississippi. Data are given of bushels per acre, lodging, earworm and rice weevil infestation, ear height, ears per plant, length and tightness of husk, shelling and moisture percentages and the percentage of plants erect at harvest.

470 Riedl, W. A.
Wyoming hybrid corn performance trials 1951-1954.
Bull. Wyo. agric. Exp. Sta. 1955 : No. 338 : Pp. 11.

Data on the yields of grain and green forage of about 30 hybrids and varieties tested for adaptation to various regions in Wyoming are presented and discussed.

471 Nakamura, N. & Tate, S.
(**Estimation of the number and values of the genes determining combining ability in maize and of the heritability of combining ability**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 46–50. [Japanese].

The above characteristics were calculated from the data provided by a series of single and back crosses of maize inbred lines. The number of factors was found to be lower and their values higher than would be expected if combining ability were polygenically determined. The heritability estimates were higher than those obtained by Rojas and Sprague (cf. *PBA*, XXIII, Abst. 1140).

472 SPRAGUE, G. F.
Corn genetics. Proceedings of the Fourth Annual Meeting of the Agricultural Research Institute.
Nat. Acad. Sci.—Nat. Res. Counc., Washington, October 17–18, 1955 : 60–65.

A broad historical outline is given of the genetical discoveries underlying the development of hybrid maize in the USA. Possible directions of future progress are discussed, the use of cytoplasmic male sterility in combination with pollen-restoring genes, breeding for resistance to diseases and pests and for chemical characters, and the genetical nature of heterosis being touched upon.

473 SUTÔ, T.
Genetical behavior of a dotted aleurone character in maize.
Jap. J. Bot. 1953 : **14** : 169–86.

The genetics of dotted aleurone in a linkage tester stock sent by R. A. Emerson to Japan in 1937 was investigated by crossing with three Japanese stocks. The dotting appeared to be due to the interaction of a_1 and *Dt* as described by Rhoades (cf. *PBA*, VIII, Abst. 1533 and XII, p. 180). Three modifying genes from the Japanese stocks, which reduced the mutagenic effect of *Dt* on a_1, were detected.

Le maïs. (**Maize**).
Bull. tech. Ing. Serv. agric. 1955 : No. 105 : 679–887.

474 *Maïs hybrides: expérimentation réalisée par les stations d'amélioration des plantes de l'I.N.R.A. (Hybrid maize: experimental work carried out by the plant breeding stations of the National Institute of Agronomic Research). (pp. 707–38).*

American single and double hybrids were compared with local out-pollinated varieties at a number of localities throughout France and various cultural techniques were essayed. Recommendations, based on the results of these experiments, are made as to the varieties most suitable for the production of grain and silage in the different regions of France and data on yield, moisture content of the grain and number of days to maturity are given.

475 *Alabouvette, L. État actuel des travaux d'amélioration du maïs. (Present state of breeding work with maize). (pp. 739–41).*

Factors of importance in breeding hybrid varieties for cultivation in France include resistance to drought, cold, lodging, diseases and insect pests; suitability for mechanical harvesting is also becoming increasingly important. A large number of crosses between American and French varieties have been carried out at the Montpellier Plant Breeding Station and some of the hybrids thus obtained have proved superior to Goudster [Golden Star], W240, W255 and U22 in north and central France.

476 *Rautou, S. & Bertin, C. Contribution apportée à l'amélioration du maïs par les stations de Montpellier et Saint-Martin-de-Hinx. (Contribution made to maize breeding by the Montpellier and Saint-Martin-de-Hinx stations). (pp. 742–51).*

Progress achieved in maize breeding at the above stations since 1945 is reviewed briefly and the results obtained with certain of the more promising experimental hybrids are given. A number of experimental double hybrids, especially those involving the cross Imp 91 x A310, have proved highly productive and also possess good resistance to lodging.

477 *Schad, C. & Kiss, C. Contribution apportée à l'amélioration du maïs par la Station d'amélioration des plantes du Massif Central. (Contribution made to maize breeding by the Massif Central Plant Breeding Station). (pp. 752–62).*

The American hybrids W240, W255, W335 and Minhybrid 706, all of which mature in 80–95 days, are the most suitable at the present time for cultivation in the Massif Central of southern France. The results of top crosses involving these hybrids are reported. One of the main breeding objectives at the above station is the development of an early-maturing hybrid possessing a greater degree of resistance to lodging than Minhybrid 706 but maturing at about the same time; the experimental double hybrids I118, I137 and I158 fulfil these requirements. Other promising double hybrids at the station include I155, I134 and I212, which are resistant to lodging and smut, and 1–85, 2–D, 3–H, 4–9 and 5W153R.

478 *Cauderon, A. & Lascols, X. Contribution apportée à l'amélioration du maïs par la Station centrale de génétique et d'amélioration des plantes de Versailles. (Contribution made to maize breeding by the Central Station of Genetics and Plant Breeding, Versailles). (pp. 703–70).*

Objectives at the above station include the development of varieties that mature earlier than W240 but slightly later than W255 and breeding for resistance to low temperatures, lodging and smut. A number of experimental hybrids that appear to be suitable for cultivation in the north of France are undergoing trials.

479 *Etchebarne, J. La production des hybrides simples et lignées pures. (The production of single hybrids and pure lines). (pp. 771–74).*

The technique of producing hybrid seed by crossing inbred lines is outlined briefly with reference to hybrid maize production in France.

480 FENAROLI, L.
Produzione delle sementi ibride di mais in Italia e norme tecniche di controllo e certificazione. (**Production of hybrid maize seed in Italy and technical regulations for control and certification**).
Maydica, Bergamo 1956 : **1** : 67–70.

A statement is given of the regulations laid down for the production of certified seed of maize hybrids in Italy.

481 CAVAZZA, L.
La maiscoltura in Calabria. (**Maize cultivation in Calabria**).
Maydica, Bergamo 1956 : **1** : 71–84.

In a general account of maize cultivation in the province of Calabria in southern Italy reference is made to tests of 23 hybrids carried out in 1954 and 1955, in which grain yields of over 31 c. per ha. were recorded, representing 231% more than the yield attained from the local varieties. The most promising hybrids were Insubria 521, Ohio M34, U28, U32, Wisconsin 270, Wisconsin 464 and the Dutch hybrid CIV7. There was a greater proportion of poor grain however in the hybrids and they were more severely attacked by the corn borer and the production of hybrids improved in this respect is awaited before their cultivation can be recommended unreservedly.

482 Milho híbrido: o que é e como se cultiva. (**Hybrid maize: what it is and how to grow it**).
Sér. Divulg. Direcç. ger. Serv. agríc., Lisboa 1956 : No. 32 : Pp. 15.

This is a special edition of the bulletin referred to in *PBA*, XXIV, Abst. 2906, designed for readers in the Azores.

483 USENKO, V. V.
(**VIR156, a valuable maize hybrid**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 1 : 49–52. [Russian].

The double cross VIR156 [Institute of Plant Industry 156] was bred at Kubanskoe, Crimea. It outyields the double cross VIR42 and the standards Leaming, Sterling and Krasnodar 1/49 by a good margin in the southern districts of the Krasnodar territory. It has a growth period of 127 days, does not lodge and produces ears 23·7 cm. long, longer than those of any other form at Krasnodar. The ear weighs 338 g. as against 206 g. of VIR42 and 225 g. of Krasnodar 1/49.

484 BECKER, W. R.
Züchtung und Saatguterzeugung von Hybridmais in den Niederlanden. (**Breeding and seed production of hybrid maize in the Netherlands**).
Arch. dtsch. LandwGes. 1956 : **17** : 84–94.

An account is given of the production of inbred lines and hybrid seed in the Netherlands, from both local and American material. Rapid initial growth and early maturity are the primary aims and hybrids combining these qualities have been obtained from crosses between American inbreds and early-maturing Dutch selections. Of these hybrids, Goudster [Golden Star] has proved especially promising. Dutch regulations on certification of hybrid seed are also outlined.

Report of Tenth Hybrid Corn Industry Research Conference held in Chicago, Illinois, November 30 and December 1, 1955 : Publ. Amer. Seed Tr. Assoc. 1955 : No. 10 : Pp. 119.

485 *Stringfield, G. H. Introduction to "techniques in evaluating hybrids." (pp. 7–9).*

Some aspects of testing hybrids, such as the influence of environmental factors and suitable criteria of productiveness, are briefly discussed.

486 *Sprague, G. F. Replication versus location. (pp. 10–13).*

The problem of the most efficient distribution of a given number of plots in respect of number of years of testing, number of localities and replications is examined.

487 *Baker, R. From lines to commercial corn. (pp. 14–17).*

With reference to hybrid breeding at the Pioneer Hi-Bred Corn Company, Des Moines, Ia., the author discusses the following: simplifications in testing inbreds and single crosses, notably the use of single-cross seed parents as testers in three-way crosses with inbreds to obtain data for the prediction of double-cross performance; the value of small-plot replicated tests in testing double hybrids; and a small-plot technique of estimating suitability for mechanical harvesting by hitting the butt end of the ear with a rubber mallet.

488 *Rossman, E. C. The stand problem. (pp. 18–23).*

With an increased rate of planting in experiments in Michigan, a few hybrids produced consistently higher yields, others showed a reduction in yield and the majority gave no response or an inconsistent one. Within a given hybrid, the yields of two populations differing in density tended to be correlated but since exceptions were frequent evaluation of hybrids at two or more densities is recommended.

489 *Freeman, W. H. Evaluating hybrids in the South. (pp. 24–31).*

Hybrid testing is discussed with reference to the following: the more variable environmental conditions affecting maize production in the southern states compared with the corn belt; field design; husk protection against the rice weevil (*Sitophilus oryzae*); the desired multiple-eared condition; reaction to diseases; weather conditions subsequent to maturity and their effect upon kernel quality; and recent changes in farming practices in relation to the characters required in hybrids.

490 *Singleton, W. R. "Mutation breeding". (pp. 32–40).*

An outline is given of early work on the induction of hereditary changes by radiation in plants and animals and of the application of radiation techniques to induce economically useful mutants in crops in the USA and Europe.

The paper includes an account of research at the Blandy Experimental Farm of the University of Virginia, where a project has been initiated to induce mutants of maize resistant to *Helminthosporium turcicum* or *H. carbonum* by treatment of the pollen with thermal neutrons.

491 *Wallace, H. A. "Public and private contributions to hybrid corn—past and future". (pp. 107–15).*

The past and future roles of public and private organisations in the development of hybrid maize in the USA is discussed with reference to practical breeding and to fundamental genetical problems.

492 **Corn hybrids and varieties. 1954 tests in Mississippi.**
Bull. Miss. agric. Exp. Sta. 1955 : No. 527 : Pp. 16.

Corn hybrids and varieties. 1955 tests in Mississippi.
Circ. Miss. agric. Exp. Sta. 1956 : No. 201 : Pp. 16.

The results of tests carried out on commercial and experimental hybrids at several localities in Mississippi are reported.

493 **Hybrid corn developed.**
What's New Crops Soils 1956 : **8** : No. 9 : p. 24.

The yellow double-cross maize hybrid AES808 has been released by Purdue University, Ind. Slightly higher yielding than US13, it has much better standing ability.

494 Lonnquist, J. H. & McGill, D. P.
Performance of corn synthetics in advanced generations of synthesis and after two cycles of recurrent selection.
Agron. J. 1956 : **48** : 249–53.

Synthetics produced by intercrossing S_1 lines of high combining ability, as determined by their performance in test crosses, showed an improvement in yield in successive generations of synthesis and tended to mature slightly later. The average yield and moisture content at harvest of four synthetics after two cycles of recurrent selection were, respectively, 96% and 105% of the values obtained for the hybrid US 13, while the values for the first-cycle synthetics were 82% and 103%. The genetical value of the populations was studied by testing all possible combinations within each cycle. The average yields and moisture contents at harvest were, respectively, 108·4 bushels and 18·8% moisture for first-cycle intercrosses, 114·6 bushels and 19·2% moisture for the second cycle and 108·4 bushels and 19·0% moisture for the control, US13.

495 Sasso, G.
I mais ibridi in coltura estiva. (**Hybrid maize grown in summer**).
Sementi elette 1956 : **2** : No. 5 : 36–44.

A number of Italian maize varieties and several hybrids were tested at Turin in 1954 and 1955 for their suitability for sowing as a second crop after wheat. All the hybrids but one exceeded the local varieties in yield in both years; in 1954 the best of the hybrids, Funk's G19, exceeded the best of the varieties, Sacra Famiglia, by 57·38%, giving a yield of 43·28 c. of grain per ha.; in 1955 the best hybrid was Wisconsin 355 with 55·78 c. per ha. as against 53·71 c. from Funk's G19 and 12·90 c. from the best variety; the former difference was not significant.

496 Brandolini, A.
Il Wisconsin 270. (**Wisconsin 270**).
Maydica, Bergamo 1956 : **1** : 85–88.

A description is given of this early-maturing dent hybrid and its genetic constitution, with advice as to how best to produce seed of it. In tests in various parts of Italy it has given good results and in summer sowings has slightly exceeded the variety Sacra Famiglia [Holy Family] in grain yield.

497 Dios, R. & Dios, G.
Contenido en macro y micronutrientes del grano de algunos híbridos de maíz cultivados en Galicia. (**Content of macro- and micronutrients in the grain of some maize hybrids cultivated in Galicia**).
An. Edafol. Fisiol. veg. 1956 : **15** : 231–52.

Analyses of the grain of 20 hybrids grown under identical conditions in northern Spain showed considerable variation in content of P, K, Ca, Mg, Na, S, Fe, Mn, Cu, Zn, Co and Mo; the variations were not correlated with differences in yield between the hybrids.

498 Moschini, E.
Consumi idrici ed apparato radicale del granoturco. (**Water consumption and root system of maize**).
Ann. Fac. Agr. Pisa 1955 : **16** : 209–30.

Comparisons were made of the hybrid Wisconsin 270 and a local Italian variety grown under identical conditions, with controlled humidity and in specially designed boxes that permitted the extraction of the intact root system of the plants when mature. The grain yield of the hybrid was significantly higher than that of the local variety, which showed signs of wilting earlier than the hybrid, though its total water consumption was somewhat greater than that of the hybrid. The root system was heavier and more extensive in the hybrid but the ratio of root weight : weight of aerial portion was less, being 1 : 10·80 in the hybrid and 1 : 8·61 in the variety; the roots of the hybrid penetrated more deeply, had a greater proportion of secondary roots and covered a greater area of soil.

499 Clem, M. A., Mosier, C. C. & Sprague, G. F.
Simplified punched card procedures for predicting double cross performance.
Agron. J. 1956 : **48** : 319–20.

Procedures for predicting double-cross performance in maize from data on single or three-way crosses by means of punched cards are outlined.

500 Pap, E.
A heterózisos kukoricanemesítés kérdései. I. (**Questions concerning the breeding of hybrid maize. I.**).
Martonvásár. növényterm. Kutató Int. Évkön. 1950 (1952) : **1** : 95–111.

Trials in Hungary have indicated the desirability of introducing hybrid maize for cultivation, the standard open-pollinated variety Mezőhegyes F being greatly surpassed in yield by the hybrids tested.

The article includes a discussion of experimental layout of field trials.

501 Sayed Galal Sayed
Heterosis in corn; and the role of photosynthesis in the development of *Puccinia sorghi* Schw.
Diss. Abstr. 1956 : **16** : Publ. No. 15,427 : p. 216.

When homozygous the recessive gene cl_1 in maize results in albino seedlings. The gene was found to have a pleiotropic effect of reducing vigour in seedlings grown in light or darkness. The heterozygote proved to be superior to the dominant homozygote in growth in either darkness or light. Possibly the heterozygote was characterized by intraallelic interaction of the overdominant type. Supplied with a 0·3 M sucrose solution via the leaf tips, albino seedlings with different genotypes varied in their reactions to physiological races of *P. sorghi.* When supplied with sucrose via the leaf tips, normal seedlings of wheat and maize differentials for *P. triticina* and *P. sorghi* respectively did not show altered reactions to rust races. Physiological specialization in the pathogen did not therefore depend upon carbohydrate supply in the host.

502 Stadler, J. K.
An analysis of instability at the *R* locus in maize.
Diss. Abstr. 1956 : **16** : Publ. No. 14,972 : 435–36.

The unstable alleles $R^v - 1$: Cornell, $R^v - 2$: Cornell, r^v: Cherry and r^v: Beltsville, which cause variegation in the colour of the plant but not of the seed, differed in the intensity of pigmentation produced upon mutation for self colour and in their response to modifiers. Instability was not dependent upon any activators; it is suggested that it involved a process of temporary inhibition and release.

503 Richardson, D. L.
The analysis of a compound locus in maize as revealed by genic instability.
Diss. Abstr. 1956 : **16** : Publ. No. 15,256 : 220–21.

Data on the types of mutants isolated from stocks carrying the locus a^{Pm} affecting aleurone and pericarp colour suggest that this locus consists of the following linearly arranged components: α, controlling production of pale pigment; β, conditioning formation of dark pigment; P^b for dominant brown pericarp; and *M* for mutability involving loss of activity of the other components. The data further suggested that the inhibitory activity originating from M may proceed along the chromosome in either direction and that intermediate components may be inhibited. Three possible arrangements are postulated: centromere–P^b–M–α–β; centromere–P^b–M–β–α; and centromere–β–M–α–P^b. Changes in M are liable to affect closely linked genes controlling chlorophyll production and viability.

504 Phinney, B. O.
Biochemical mutants in maize: dwarfism and its reversal with gibberellins.
Plant Physiol. 1956 : **31** : Suppl. : p. xx. (Abst.)

Cf. *PBA*, XXVI, Abst. 3277.

505 Mesa Bernal, D.
Origen del maíz en México y Guatemala. (**The origin of maize in Mexico and Guatemala**).
Agricultura trop. 1956 : **12** : 287–98.

Extracts from the early chronicles are cited to show that maize was widely cultivated in Mexico at the time of the conquest by the Spaniards; reference is made to fossil maize specimens dated 2500 BC which resemble the variety Nal-tel grown today in Mexico and to the diversity of maize types in Mexico and Guatemala commented on by several investigators and an outline is presented of the theory of Mangelsdorf as to the origin of maize.

506 Mesa Bernal, D.
Lexicografía aborigen del maíz. (**Aboriginal lexicography of maize**).
Agricultura trop. 1956 : **12** : 389–90.

The names by which maize is designated in a number of languages and dialects of S. America are given, showing that the Spanish name *maíz* or *mahiz* derived from the dialects of Haiti, Cuba and certain other Caribbean islands.

507 Mesa Bernal, D.
Noticias sobre el maíz en algunas regiones del occidente Colombiano. El maíz en Antioquia en la época de la conquista. (**Notes on maize in some regions of western Colombia. Maize in Antioquia at the time of the conquest**).
Agricultura trop. 1956 : **12** : 463–64.

Evidence from the early chroniclers is cited against the belief that maize cultivation could have arisen in the Antioquia region.

508 Gopinath, D. M. & Burnham, C. R.
A cytogenetic study in maize of deficiency-duplication produced by crossing interchanges involving the same chromosomes.
Genetics 1956 : **41** : 382–95.

A theoretical study was made of the chromosome types to be expected in the F_1 progenies of crosses between parents each carrying an interchange in the same chromosome. The theoretical results were compared with the results of crosses of maize lines carrying translocations of the sort indicated. Data are given on the pollen abortion percentages of the F_1 plants, the genetics of deficiencies and the pachytene and diakinesis configurations of the F_1 progenies.

509 Blackwood, M.
The inheritance of B-chromosomes in *Zea mays*.
Abstr. Diss. Univ. Camb. 1953–1954 (1955) : 16–17.

The loss of B chromosomes in many gametes, resulting from nondisjunction of the B chromosomes at anaphase I and at the second division of the pollen grain, is counterbalanced by the preferential fertilization of eggs by gametes with large numbers of B chromosomes. Progenies from crosses between unrelated parents differed significantly in mean number of B chromosomes and in the distribution of plants with different numbers of B chromosomes, but such differences were not observed among crosses in which the same pollen parent was used, indicating that preferential fertilization and rate of nondisjunction differ in different plants but are constant for any particular individual. It is concluded that frequency of nondisjunction of B chromosomes and degree of preferential fertilization are determined by the genotype of the A chromosomes.

510 Kuperman, F. M.
(**Biological control of development and growth in maize plants**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 1 : 14–21. [Russian].

Physiological observations made in Moscow on the growth and development of the reproductive organs of many varieties differing in growth period are reported.

511 Brandolini, A.
Mais in coltura estivo-autunnale dopo frumento. Parte II. (**Maize in summer-autumn cultivation after wheat. II**).
Ann. Sper. agr. 1956 : **10** : 1111–41.

The second part of this article (cf. *PBA*, XXVI, Abst. 3285) records the results of selfing a number of early-maturing Italian varieties that are normally used for sowing after wheat. Several of the first-generation lines from selfing Sacra Famiglia [Holy Family] when crossed with the original Sacra Famiglia gave hybrids with increased yield, exceeding that of Wisconsin 355; 12 of these lines were selected as those having the best combining ability.

A number of semiflint hybrids between early dent inbreds and flint inbreds tested in comparison with Sacra Famiglia and other early types proved superior to the dent hybrids and the open-pollinated varieties; and some of them when harvested had a humidity only about 5% above that of Sacra Famiglia in the grain; these were all hybrids in which lines Lo12, Lo22 and Lo72 figured in the parentage, these being inbred lines isolated from the varieties Nostrano dell'Isola and Scagliolino GV precoce [Early Scagliolino GV].

A synthetic variety constituted from the best lines selected from Sacra Famiglia gave a grain yield of 30·75 c. per ha. compared with 24·2 c. from Sacra Famiglia and could be harvested a week sooner; the hybrid had a slightly higher proportion of grain to ear weight and a lower proportion of immature grains.

A number of crosses of early dent hybrids from the USA with some lines isolated from early Italian flint varieties and with the synthetic referred to above nearly all exceeded Sacra Famiglia and the hybrids Min.667 and Wisc.355 in yield and ripened within two days of Sacra Famiglia; the best of these hybrids yielded 64–74% more grain than Sacra Famiglia.

512 Galeev, G. S.
(Utilizing male sterility in maize breeding).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1956 : No. 1 : 29–36. [Russian].

Work on the production of male-sterile lines and a scheme of breeding based on it which is used at Kubanskoe, Crimea are described. Male sterility was introduced from the North Osetian variety Mestnaja [Local], Moldavanskaja Želtaja [Yellow Moldavian] and Moldavanskaja Oranževaja [Orange Moldavian] into the Institute of Plant Industry (VIR) lines 28, 29, 30, 40, 44, 51 and 116, the single crosses 28 x 29, 44 x 38, 133 x 64 and 51 x 64 and the varieties Voronež 76, Čakinskaja Žemčužina [Čakvi Pearl] and Harjkov 23. Material thought to be a likely source for restoring fertility to male-sterile lines is listed.

513 Sutô, T.
Cytogenetical studies of male sterility in maize. I. On a case of genic semi-sterility.
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. Ser. D : 1955 : No. 5 : 137–78.

A form of partial male sterility due to desynapsis and plasmodium formation was discovered in a 2nd linkage tester stock sent to Japan by R. A. Emerson. The condition is determined by a single recessive gene denoted by *em*; the expression of the gene, however, is markedly affected by environmental conditions.

514 **Hybrid seed corn without detasseling.**
Seed World 1956 : **78** : No. 12 : 14, 26.

A popular account of the steps involved in producing double-cross hybrids through the use of cytoplasmic male sterility is presented.

515 Campbell, A. D.
Electrophoretic analyses of protein fractions extracted from an inbred and a hybrid variety of corn.
Diss. Abstr. 1956 : **16** : Publ. No. 15,398 : 442–43.

Approximately 82% of the total N of the maize inbred H5 and approximately 71% of the total N of the hybrid US13 were subjected to electrophoretic analysis. Some differences were detected in the electrophoretic patterns of the inbred and hybrid. A fast-moving minor component with negative mobility was for instance found in the phosphate-buffer extracts of US13 but not of H5.

516 Neal, N. P. & Davis, J. R.
Seed viability of corn inbred lines as influenced by age and conditions of storage.
Agron. J. 1956 : **48** : 383–84.

Seeds of 16 inbred lines of maize harvested in 1949 were stored for varying numbers of years at room temperature or 40° F. and were then germinated (1) at room temperature and (2) under "cold-test" conditions at 50° F. for 10 days, with and without a fungicidal protectant. The value of cold storage in maintaining stocks for several years and of fungicidal treatment as a means of obtaining higher percentages of germination was demonstrated. The cold-test results for cold-stored treated seed indicated that in most cases satisfactory field stands could have been obtained at least in 1953 and in many cases even in 1956. Some inbreds maintained their viability better than others, even when stored at low temperature.

517 CLARK, J. A.

Collection, preservation and utilization of indigenous strains of maize.

Econ. Bot. 1956 : **10** : 194–200.

A Committee on the Preservation of Indigenous Strains of Maize was formed by the National Academy of Sciences—National Research Council of the United States with the aim of collecting and studying open-pollinated strains in the Western Hemisphere. This article gives information on the personnel concerned, financial organization, cooperating bodies, the work of collection, centres and methods of preservation, utilization and future plans for cooperative studies.

518 CLELAND, R. E.

Report of the committee on preservation of indigenous strains of maize.

Proceedings of the Third Annual Meeting of the Agricultural Research Institute. Nat. Acad. Sci.—Nat. Res. Counc., Washington, October 4–5, 1954 : 36–37; also Proceedings of the Fourth Annual Meeting, October 17–18, 1955 : p. 28.

An account is given of progress made in the collection and study of native strains of maize in North and Latin America (cf. Abst. 517).

519 LANG, A. L., PENDLETON, J. W. & DUNGAN, G. H.

Influence of population and nitrogen levels on yield and protein and oil contents of nine corn hybrids.

Agron. J. 1956 : **48** : 284–89.

In trials carried out at three nitrogen levels and six planting rates during two years at Urbana, Ill., differences in yield response to the various treatments were found among the nine single-cross hybrids studied. Hybrids tending to bear several ears per plant at low population rates had the lowest percentage of barren stalks at the high planting rates. Protein and oil content both varied significantly with hybrid and with treatment.

520 HOOKER, A. L.

Association of resistance to several seedling, root, stalk, and ear diseases in corn.

Phytopathology 1956 : **46** : 379–84.

The reactions of 25 dent inbreds to inoculations and natural infections resulting in the development of the basal stalk rot, root necrosis and ear rot phases of *Diplodia zeae* and the basal stalk rot and ear rot phases of *Gibberella zeae* were determined. Seedling reactions to artificial inoculation with *Pythium debaryanum*, *P. graminicolum*, *D. zeae* and *G. zeae* were also studied. Significant differences in reaction to all the infection tests were found among the 25 strains. Since the correlation coefficients obtained between reactions to the different stalk rots and between reactions to the stalk rots and to root necrosis were high, positive and highly significant, it is suggested that in early generations of breeding, selection for resistance to the stalk rots and root necrosis may be satisfactorily effected by testing for resistance to *Diplodia* stalk rot alone.

521 CRANE, P.

Factors affecting resistance to Pythium seedling blight of maize incited by *Pythium ultimum*.

Agron. J. 1956 : **48** : 365–68.

The maternal pericarp tissues and the germinating embryo were found to constitute two distinct and genetically independent sites of resistance to *P. ultimum*. No evidence of cytoplasmic influence upon resistance was obtained. Ear-to-ear variation in resistance was closely and inversely related to the content of reducing sugars leached from the kernels; the variation in their content was due to environmental effects upon the maternal plant.

522 SILVA, J. B. VIEIRA DA

Leaf blight and yield in S_1 inbreds of two varieties of maize.

S. Afr. J. Sci. 1956 : **52** : p. 226.

The correlation between yield and resistance to *Helminthosporium turcicum*, one of the chief diseases of maize in the central plateau of Angola, was significant in 110 inbreds of Amarelo Laranja [Yellow Orange] but barely significant in 155 inbreds of Branco Redondo [White Round]. The latter variety is however better adapted and more resistant in the plateau. Possibly resistance is of less relative importance in Branco Redondo, other factors affecting yield being more influential.

523 DIMMOCK, F.

Corn breeding in Canada.

Agric. Inst. Rev. 1956 : **11** : No. 4 : 13–14, 40.

The following techniques are being employed in corn breeding at Ottawa and Harrow, Ontario, and at Morden, Manitoba: (1) second and third-cycle breeding, a method in which new inbreds are isolated from back crosses and single and double-cross hybrids which have shown superiority in comparative tests, the reselected lines being used in new hybrid combinations and subjected to further cycles of inbreeding; (2)

gamete selection, the procedure being to pollinate a selected inbred with a random collection of pollen from a chosen open-pollinated variety and to select for inbreeding those F_1 plants which do better than the inbred parent in crosses with a tester; and (3) recurrent selection. The production of homozygous lines by treating monoploids with colchicine has been studied at Ottawa, but the method appears to be of little practical use. In addition to testing inbreds by top crossing followed by crossing in various single-cross combinations, inbreds are now also evaluated by crossing with one or more standard single-cross testers, usually those which have done particularly well as seed parents in commercial hybrids; this method allows double-cross performance to be predicted and permits the selection of outstanding three-way hybrids.

The production of hybrids resistant to root and stalk rot caused by species of *Fusarium* and *Pythium* is receiving attention and so far two highly resistant lines, CH9 and B14, have been obtained. Cytoplasmic male sterility has been transferred to a number of good inbreds and the isolation of lines with genes for pollen restoration is also under investigation.

524 NELSON, R. R.
Resistance to the stunt nematode in corn.
Plant Dis. Reptr. 1956 : **40** : 635–39.

Seedlings of a series of hybrids commonly grown in the Coastal Plain of North Carolina and of 50 of their component inbreds were tested for their reactions to the tobacco stunt nematode *Tylenchorhynchus claytoni*. All the hybrids and 21 of the inbreds were susceptible. The remaining 9 inbreds showed only slight damage. It is concluded that susceptibility is dominant to resistance since the progenies of two crosses between susceptible and resistant inbreds, F44 x F6 and T204 x NC7, were both susceptible.

525 COX, H. C.
Feeding habits of European corn borer larvae on selected field corn inbreds and single cross hybrids.
Iowa St. Coll. J. Sci. 1956 : **30** : 343–44. (Abst.).

The resistance of the inbred maize lines A295 and W22 to first-brood larvae increased with plant growth, but the resistant inbred Oh43 and the susceptible lines WF9 and M14 did not change in reaction. The most resistant plant parts differed in the different inbreds or hybrids. Hybrids resistant to first-brood larvae were not resistant to those of the second brood.

BARLEY

526 **A report on three years' experimentation with barley varieties 1953 to 1955.**
Tech. Bull. Edinb. Coll. Agric. 1956 : No. 15 : Pp. 12.

Information from 14 trials held in Scotland is provided on the grain yield, days to maturity, straw strength and length and malting and brewing quality of Carlsberg, Drost, Herta, Proctor, Rika and Ymer.

527 Wintergerst, 1956. (**Winter barley, 1956**).
Landbouwvoorlichting 13 : Bijl. 13; Ber. Rassenkeuze 1956 : No. 210 : unpaginated.

Data on the relative yields, on different types of soil, of the principal varieties cultivated in the Netherlands are tabulated, together with brief notes on winter hardiness, maturity, quality of the grain and lodging resistance. The new varieties Trias, Atlas and Herfordia are gaining in popularity.

528 NAKAGAWA, M. & WATANABE, M.
(**On the new naked barley Isehadaka**).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1955 : No. 2 : 203–06. [Japanese].

The above variety was selected from Akashinriki [Red Divine Power] x Shirochinko. It is a productive spring variety resistant to excessive moisture and mildew and is recommended for the prefecture of Mie.

529 **New 'Will Rogers' oats* almost ready in Oklahoma.**
Sth. Seedsman 1956 : **19** : No. 9 : p. 52.

A new six-rowed barley variety is described which is stiff strawed, resistant to scald and leaf rust and highly resistant to *Erysiphe* and outyields Harbine, Tenkow and Ward. It may be sown in autumn or spring, is winter hardy and ripens three days later than Harbine. The origin is not given.

530 WEXELSEN, H.
Quantitative inheritance in barley.
Meld. Norg. LandbrHøisk. 1955–56 : **35** : 171–94.

The inheritance of length of head, length of straw and earliness was studied in a cross between the Swedish local variety Asplund and the Californian barley Sacramento. Transgressive segregation was observed in length of rachis internode, length of head, length of straw and earliness.

---

* *sic.*

Data on length of rachis internodes indicated that this character is controlled by three additive genes, each of which has a greater effect in reducing internode length in material with long internodes than in genotypes with short internodes.

Negative correlations between length and number of rachis internodes in the parents indicated that a given genotype has a maximum head length and that an increase in number of internodes will be accompanied by a reduction in internode length. A negative correlation was also found between length and number of straw internodes.

The wide transgressions in lengths of head and straw resulted from the combined effect of genes for internode length and for number of internodes.

Length of rachis internodes and length of straw appeared to be affected by the same or closely linked genes. Rachis internode length was negatively correlated with number of days from sowing to heading.

531 Kiriyama, T. *et al.*

(On the new naked barley variety Hayaurehadaka).

Kyushu Nogyu Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1955 : **3** :181–96. [Japanese].

The new variety Hayaurehadaka [Early Sale naked barley] (= Norin 10 [Ministry of Agriculture and Forestry 10]) was selected from Akashinriki [Red Divine Power] x Ichiwase [Early]. It is an early, high-yielding, disease-resistant naked barley suitable for growing in Kyushu, Japan.

532 Moh, C. C. & Nilan, R. A.

Reduced gene transmission in radiation-induced mutant barley.

J. Hered. 1956 : **47** : 129–31.

Seventeen chlorophyll deficient mutants, eight of them induced by X irradiation and nine by atomic-bomb radiation, produced less than 10% mutant seedlings after self fertilization and in all but one of the lines, the proportion of heterozygotes among the surviving green plants was less than 67%. No visible chromosomal aberrations were observed during pollen meiosis in any of the mutant lines, pollen fertility was normal and seed germination was high. In reciprocal crosses of Compana with two of the mutants, the mutant gene was in each case transmitted by about 50% of the female gametes but by only 10% of the male gametes. It is suggested that the mutant loci may be the result of, or closely associated with, undetectable chromosomal aberrations, such as minute deficiencies or duplications, which confer a competitive disadvantage upon the male gamete.

533 Das, K.

Cytogenetic studies of partial sterility in X-ray irradiated barley.

Indian J. Genet. 1955 : **15** : 99–111.

In the X_2 generation of X-irradiated *Hordeum vulgare* 'Mars', a number of semisterile plants were found which had no translocation rings. These plants were crossed *inter se* and the F_1 and F_2 studied with a view to determining the causes of sterility. Cytological studies revealed structural changes, characterized by translocations and paracentric inversions, in the chromosomes and frequent chromatin bridges and acentric fragments at meiosis in the pollen mother cells. Pollen abortion was high, averaging 41·1%. The uniformity and small size of the acentric fragments suggested that they were due to a single short inversion of a distal segment. A high rate of ovule abortion, averaging 37·7%, was also observed in the same plants; this is thought to be due either to the action of a lethal gene or to the fact that the cross overs are abnormal (cf. *PBA*, XXI, Abst. 1979).

534 Sarić, M. R.

Proučavanje promena pod uticajem kalemljenja (transplantacija) kod ječma. **[Studying the changes induced by grafting (transplantation) in barley].**

Arh. poljopr. Nauk. 1955 : **8** : No. 21 : 61–76.

Heritable changes obtained with regard to awn and ear characteristics in *Hordeum vulgare* var. *trifurcatum* by grafting the embryo on to the endosperm of *H. distichum* var. *nudum* at Zemun are described. The mode of segregation in the first and succeeding seed generations resembled that of sexual hybrids. Among the segregates were a two-rowed form with awns three times longer than the ear, another two-rowed form, which instead of awns had short triangular extensions, and a five-rowed form, with awns and triangular extensions unevenly distributed over the whole ear.

535 Giessen, J. E., Hoffmann, W. & Schottenloher, R.

Die Gersten Äthiopiens und Erythräas. **(The barleys of Ethiopia and Eritrea).**

Z. Pflanzenz. 1956 : **35** : 377–440.

The characteristics of the Formenkreise of barleys from Ethiopia and Eritrea are described and summarized in tabular form and the importance of this region as one of the main gene centres of barley is discussed in detail. The collection studied derives from an expedition made to Ethiopia and Eritrea in 1937–38; much of the material obtained was lost during the war but sufficient plants survived for a detailed study to be made at Voldagsen in the period 1946–51. The collection comprised 68 botanical varieties and included representatives of all 5 convars; notes are given on the distribution and incidence of such characters as colour of ear, grain and foliage, types of awn, glume characteristics, leaf shape, length and thickness of straw, earliness and disease resistance in the different geographical areas covered by the expedition. The material studied included 15 new botanical varieties, each of which is described fully, and a number of varieties known outside this region but now found in northeast Africa for the first time. Six-rowed barleys were the most frequent, followed by awned barleys of the *deficiens* type, the latter predominating in Eritrea. The ears of many of the varieties studied were distinguished by their high anthocyanin content, which imparted a reddish or reddish-brown tinge to the mature grain, especially in material derived from the southern part of the territory explored; in some cases a considerable amount of anthocyanin was also found in the stalks and upper leaves. All the barleys studied were early-maturing spring types, the earliest variety being var. *nudideficiens* from southern Ethiopia. The region studied is considered to constitute one of the principal gene centres for barley but, despite the multiplicity of forms found there, is not thought to be a primary centre of origin of this cereal. No wild barleys were found and the crop appears to have been introduced into the area by the Amharic invaders. Among the more valuable properties possessed by some of the barleys studied were prolific tillering, thick stalks resistant to lodging and breaking, high 1000-grain weight, high protein content and resistance to *Erysiphe graminis*, *Puccinia simplex* and *Ustilago* spp.

536 Sharma, A. K. & Mukherji, R. N.
Chromosome studies in some Indian barley. II.
Proc. Indian Acad. Sci. 1956 : **43** : 279–87.

The caryotypes of six strains of *Hordeum vulgare* obtained from the Indian Agricultural Research Institute, New Delhi, were studied at Calcutta University by means of the smear technique referred to in *PBA*, XXV, Abst. 1588. The strains, all with $2n = 14$, showed some differences, notably in the number of chromosomes having a secondary constriction. B122 had one pair of such chromosomes, B17, B42, B134 and B135 two pairs and the remaining strain B137 three. B137 was the only strain possessing a pair of "type E" chromosomes in which the primary and secondary constrictions were very near to each other. It is suggested that structural chromosomal changes may have been responsible for the differentiation of the strains.

537 Davies, D. R.
The structure of the centromere in relation to metabolic activity.
Chromosoma 1956 : **8** : 221–28.

Numerous abnormalities were observed in the tapetal cells of two intervarietal barley hybrids, and included the following: polyploid nuclei and multinucleate cells; chromosome stickiness; differential condensation of the chromosomes; overcharging of the centromeric chromomeres with nucleic acid; prominently divided centromeres at mitotic prophase; and precocious centromeric repulsion. The irregularities could all be attributed to an upset in nucleic acid metabolism. In an attempt to reconcile the common view that the centromere is undivided at mitotic metaphase and at metaphase II of meiosis with observations, carried out on material treated with c-mitotic substances and on untreated material, that it is double at these stages (cf. *PBA*, XXV, Absts. 2669–70), it is suggested that, since centromeric behaviour varies under different conditions within the same organism, the centromere may also be divided or undivided in different organisms, according to the metabolic conditions, the single state being most common.

538 Caldecott, R. S.
Effects of hydration on X-ray sensitivity in *Hordeum*.
Rad. Res. 1955 : **3** : 316–30.

A detailed report is given of investigations referred to in *PBA*, XXVI, Abst. 1304.

539 Nishimura, Y., Saito, T. & Sakaguchi, S.
(Analysis and synthesis of reciprocal translocations in barley. II).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **5** : 220–26. [Japanese].

Continuing the work summarized in *PBA*, XXIV, Abst. 2960, the authors have obtained lines with 8, 6, 10 and 12-membered chromosome rings by intercrossing different translocation lines. The lines with the larger rings are almost completely sterile.

540 Pollock, J. R. A.
Studies in barley and malt. VIII. Survey of the dormancy of barleys harvested in Britain in 1955.
J. Inst. Brew. 1956 : **62** : 331–33.

The incidence of dormancy in the freshly-harvested grain of different varieties of the 1955 crop is discussed and the results of germinative-energy and water-sensitivity tests are tabulated. Proctor, Kenia, Maythorpe and Spratt-Archer were practically free from dormancy. Herta, Rika and Provost were water sensitive and samples of Ymer and Plumage-Archer, although showing little tendency to water sensitivity, were particularly liable to suffer from low germinative energy.

541 Yamamoto, T.
(Studies on sterility in barley. VI.* The mechanism of the development of basal sterility in winter barley).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **5** : 268–74. [Japanese].

In continuation of the work summarized in *PBA*, XXV, Abst. 3058, the author elucidates the causes of a type of sterility confined to the lower florets of the spikelet in autumn-sown barley. Sterility appears to be a consequence of impaired development of the stamen and consequent failure of the pollen to fall on the stigma. Vernalization cures the defect.

542 Ehrenberg, L. & Saeland, E.
Effects of pile radiation on barley seeds.
J. Nuclear Energ. 1954 : **1** : 150–69.

The results of experiments on exposing barley seeds to radiation in the centre of the heavy-water reactor at Kjeller, Norway, were compared with those of parallel studies on the effects of γ and X irradiation. In the reactor, where the biological effects were mainly due to the action of nonthermal neutrons, a very high degree of sterility was produced even at doses having little effect on seedling survival, while plants surviving highly lethal doses of γ or X rays showed relatively high fertility. Presoaking the seeds had little effect on sensitivity to pile radiation. A higher proportion of the rarer chlorophyll mutations (*alboxantha, viridoalbina, tigrina* etc.) was induced by the densely ionizing radiation in the reactor than by X or γ radiation, suggesting that the mutation process may be directed by appropriate variation of the ion density. Studies of growth inhibition in seeds irradiated in (*a*) the centre of the reactor and (*b*) the concrete shield, where the effect of nonthermal neutrons was negligible, indicated that in position (*b*) thermal neutrons and γ rays have an additive effect and that thermal neutrons are, per energy-unit dissipated, more efficient than fast neutrons.

Nonthermal neutrons were 10–40 times as efficient as γ and X rays in inducing growth retardation, lethality, sterility and mutation.

543 Zonić, I. & Đokić, A.
(The characteristics of ear and awn in the barley hybrids *Hordeum distichum* x *H. vulgare* var. *trifurcatum* and *H. distichum* x *H. vulgare* var. *pallidum* in the F_1 and F_2).
Zborn. Rad. poljoprivred. Fak./Rev. Res. Wk. Fac. Agric., Beograd 1955 : **3** : No. 2 : 117–32. [Serbian].

The F_1 and F_2 of the above hybrids have been investigated at Zemun. In the case of the first combination only direct crosses were effected, but direct and reciprocal hybrids were obtained from the second. The F_1 of *H. distichum* x *H. vulgare* var. *pallidum* showed improvements in ear length and the number of spikelets per ear, both attributed to the dominance of *H. distichum*. The tendency of *H. distichum* to form fertile lateral spikelets was evident in the F_1 hybrids, which bore up to 10 fertile spikelets with short awns. The characteristics of two-rowed ear of *H. distichum* and of trifurcate awns of *H. vulgare* var. *trifurcatum* were dominant over multiple-rowed ear and long awns. A high percentage of the F_2 of *H. distichum* x *H. vulgare* combined the long ear of the first-named parent with the multiple-rowed ear of the other. The hybrids are regarded as promising material for breeding productive multirowed forage barleys. Crossing of *H. distichum* with *H. vulgare* had little effect upon improvement of the fertility of the lateral spikelets in the F_2. Mention is made of transgressive segregation with regard to the length of ear observed in the F_2 of *H. vulgare* var. *pallidum* x *H. vulgare* var. *trifurcatum*.

544 McPherson, A. R.
English barley of the 1955 crop.
J. Inst. Brew. 1956 : **62** : 56–62.

Approximately 55% of the 1955 crop of malting barley in the eastern and southern counties of England consisted of Proctor (cf. *PBA*, XXIII,

---

* Misprinted as IV at the head of the paper.

Abst. 1180), compared with 5–10% for the 1954 crop. This variety equalled or slightly exceeded in yield the Scandinavian varieties grown for malting and it withstood adverse weather around harvesting. Data obtained so far indicate that its properties from the maltster's point of view are satisfactory.

545 **Brewing industry research foundation. Proctor barley.**
J. Inst. Brew. 1956 : **62** : 91–92.

A review is given of information so far obtained on the properties of Proctor as a malting barley, as indicated by tests carried out by the above organization on samples from the 1954 and 1955 crops in England and Scotland and by maltsters' comments (cf. Abst. 544). On the whole the variety is considered to be a good malting type, although having minor defects which may necessitate modifications in kilning. It has also shown a tendency to be damaged either during threshing or by natural splitting.

546 Kirsop, B. H. & Pollock, J. R. A.
Comparative aspects of Proctor and Spratt-Archer barleys.
J. Inst. Brew. 1956 : **62** : 155–57.

According to the results of tests of samples from the 1954 barley crop in Britain, Proctor and Spratt-Archer are similar in germinative energy and water sensitivity. Proctor has a lower 1000-corn weight but the two varieties do not differ significantly in N content. The lower husk content of Proctor chiefly accounts for its higher yield of extract.

547 Société d'encouragement de la culture des orges de brasserie et des houblons en France. Rapports sur la campagne 1954. (**Society for the promotion of the cultivation of brewing barleys and hops in France. Reports for the year 1954**) : Pp. 75.

This report includes the results of barley trials conducted at the Maule Experimental Field, at the National Agricultural College, Grignon, and at 14 other centres throughout France. Carlsberg II, Proctor, Bonus, Aurore [Dawn] and Beka proved the most satisfactory in respect of yielding ability and malting quality combined. Albert Busser had the highest dry-matter and protein contents of the varieties tested and also the highest 1000-grain weight. Dea, a new German variety recently introduced into France, gave good yields in preliminary trials and also proved exceptionally resistant to smut (cf. *PBA*, XXVI, Abst. 2336). The F_7 of Damseaux x Probstdorf gave significantly higher yields than Bordia and its grain was of better quality; a number of other new hybrid lines have also shown promise. Analyses of malting quality, including degree of moisture, dry matter content, percentages of nitrogen and protein and proteolytic power are included for each of the varieties and hybrids tested.

548 Bell, G. D. H.
Breeding a feeding barley.
Agric. Merch. 1956 : **36** : No. 6 : 69–72.

The author holds that breeding for the combination of high protein with high yield required in a feeding barley is likely to prove extremely difficult to obtain since high yield is strongly associated with low protein. Since both yield and protein content can be increased in the field by appropriate fertilizer treatments, the production of feeding barley, it is suggested, is a question of management rather than of breeding.

549 Moseman, J. G.
Physiological races of *Erysiphe graminis* f. sp. *hordei* in North America.
Phytopathology 1956 : **46** : 318–22.

On the basis of their pathogenicity on the differential barley varieties Black Hulless, Chevron, Goldfoil, Heil Hanna 3, Nepal and Peruvian, six new and nine previously reported physiological races isolated from diseased plants in North America during 1950–54 were distinguished. The six new races were distinct from three Japanese and two Argentine races. The six differential varieties used are regarded as inadequate for the satisfactory determination of pathogenic variation for breeding purposes and studies are now in progress to select hosts carrying single genes for resistance for use in differentiating between pathogen races.

550 Jogi, B. S.
The heritability of agronomic and disease reaction characteristics in two barley crosses.
Agron. J. 1956 : **48** : 293–96.

A method of estimating heritability is described, which makes use of the fact that, in advanced generations of inbreeding, most of the genetic variance is due to additive genetic effects and only an insignificant portion to dominance. Heritability values measured by this method in F_6 bulk progenies of the two crosses Stewart x Bay and Kindred x Bay were 60–64% for yield, 90–96% for date of heading, 81–96% for test weight, 40–83% for lodging resistance, 59–77% for plant height and 69–95% for mildew reaction.

551 Loiselle, R.
Influence of maternal tissue on loose smut infection of hybrid barley kernels and inheritance of Dorsett loose smut resistance.
Diss. Abstr. 1956 : **16** : Publ. No. 16,187 : 620–21.

Histological observations on artificially inoculated kernels of the susceptible variety Odessa and resistant varieties Anoidium and Trebi, in comparison with similarly inoculated F_1-hybrid kernels from crosses of Odessa with each of these resistant varieties, indicated that the maternal tissue influenced infection of the hybrid embryo but that this effect was secondary in importance to that of the genotype of the embryo itself. Data on the F_3 of Colsess IV x Dorsett, Orange Lemma x Dorsett and CI 2321 x Dorsett suggested that the resistance of Dorsett depended upon a single pair of genes and was partially dominant. This pair was independent of *Trtr*, *Vv*, *Bb*, *Nn*, *Kk*, *Ss*, *Rr*, *Xcxc* and *Oo*, located in six of the seven linkage groups.

552 Starling, T. M.
Sources, inheritance, and linkage relationships of resistance to race 4 of leaf rust (*Puccinia hordei* Otth.), race 9 of powdery mildew (*Erysiphe graminis hordei* El Marchal.), and certain agronomic characters in barley.
Iowa St. Coll. J. Sci. 1956 : **30** : 438–39. (Abst.).

Of 374 varieties tested for field reaction to natural infection and for greenhouse reaction to race 4 of leaf rust, 147 proved to be resistant, 44 of these originating from North Africa, 18 from Turkey, 8 each from Spain and France and 14 from other European countries. In greenhouse tests of 381 varieties for seedling reaction to race 9 of powdery mildew, 228 showed resistance or a mixed reaction, 39 of the resistant varieties coming from India, 18 from Japan, 51 from other Asiatic countries, 25 from Turkey, 23 from other European countries and 35 from countries in North Africa. Thirty-two varieties showed high resistance to both the pathogen races studied.

Resistance to leaf rust race 4 was determined by a single dominant gene in Cebada Capa [Capa barley]; in crosses of 12 other resistant barleys with susceptible varieties, resistance was intermediate in the F_1, being determined by two independent factor pairs in Quinn, Carre 180 and probably CI3530–2 and by one gene pair in Modia, Batna, CI2524, CI6306, Peruvian, CI3895–2, Chilean C and Chile Brewing. Crosses with Peruvian indicated that Batna, Juliaca, CI6306, Carre 180, CI3530–2 and CI3895–2, but not Cebada Capa or CI2524, carried a factor for resistance at the *Pa* locus.

The inheritance of resistance to race 9 of powdery mildew was determined by two independent dominant factors in CI4974 and by a single dominant gene in Modia, Batna, Cebada Capa, CI2524, CI6306, CI3530–2 and CI4979. The same factor giving resistance to race 9 in CI6306, Modia and CI3530–2 also conferred resistance to races 3, 4 and 11 and Modia and CI3530–2 each had an additional independent factor for resistance to races 3 and 4 only. In 34 crosses, spring growth was dominant over winter growth, was monogenically controlled and showed some linkage with leaf-rust resistance in crosses involving Chilean C and Chile Brewing but not in other crosses. A single dominant gene governed rough awns *v.* smooth awns and was linked with the factor for spring growth with a crossing-over value of 39·3 ± 2·14%. No evidence of other linkages between the various factors was found in the crosses investigated.

MILLETS AND SORGHUMS

553 Yasue, T.
(**Autotetraploid *Panicum miliaceum* produced by colchicine treatment**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **5** : 254–60. [Japanese].

A comparative study of $2n$ and colchicine-induced $4n$ strains is reported. The $4n$ strains were taller, later and less fertile than the $2n$ forms; though the yield of the $4n$ forms was lower, the 1000-grain weight was 7·16 g. in one $4n$ strain compared with 4·16 g. in the diploids. The crude protein content of the $4n$ grains was higher than that of the $2n$ grains.

554 Žebrak, A. R. & Afanasjeva, A. S.
(**Relative fertility of tetraploid and diploid *Panicum* millets under field conditions**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1948 : **61** : 525–28. [Russian].

The tetraploid *Panicum* varieties Krupnozernoe Krasnoe [Large-grained Red] and Krupnozernoe Kremovoe [Large-grained Cream], together with the diploids Viktoria 13 and Uraljskoe Beloe [White Ural] from which they had respectively arisen, were studied. All the material bore some sterile spikelets. In Krupnozernoe Krasnoe sterile spikelets amounted to 33·2–85·5% and in Krupnozernoe Kremovoe to 75·1–98·0%.

The diploids had 47·9% sterile spikelets. The grain yield, evaluated on the basis of productivity of the main panicle, varied from 0·57 g. to 7·92 g.; the average weight for Krupnozernoe Krasnoe was 2·39 g., for Krupnozernoe Kremovoe 0·75 g. and for the diploid varieties 3·14 g. Low fertility of the tetraploids was caused by a reduced number of spikelets and a high percentage of sterile spikelets. The 1000-grain weight of Krupnozernoe Krasnoe was 8·95 g. and Krupnozernoe Kremovoe 7·46 g. as against 6·65 g. and 5·81 g. of the respective diploids. The reduced fertility of the tetraploids is attributed to irregular meiosis characterized by formation of quadrivalents. It is thought that the fertility of the tetraploids might be improved by selection of the most productive plants with the least disturbances at meiosis or by restoring normal meiosis by hybridization, notably between tetraploids from different districts.

555 VENKATARAMANA REDDY, T. & PARTHASARATHY, A. V.
A note on results obtained in the preliminary trial of exotic sorghums at the Agricultural Research Station, Lam.
Andhra agric. J. 1956 : **3** : 109–11.

Notes are given on the performance of several *Sorghum* spp. in the first year of trial at the above station in the Guntur District, Andhra.

556 LEONARD, W. H., BRANDON, J. F. & FAUBER, H.
Sorghum varieties for Colorado.
Bull. Colo. agric. Exp. Sta. 1956 : No. 494–S : Pp. 30.

The results of yield tests of varieties of grain sorghum, forage sorghum, Sudan grass and broom corn are reported. Descriptions of varieties adapted in Colorado are included.

557 **A new era in sorghums.**
Sth. Seedsman 1956 : **19** : No. 8 : p. 15.

A rapid expansion in hybrid sorghum production is expected as increased quantities of seed become available. Among the desirable properties of the hybrids are yields of 20–30% more than those of standard varieties, short stalks and erect heads facilitating mechanical harvesting, disease resistance and a shortened growing season.

558 LEONARD, W. H.
Sorghum hybrids in Colorado.
Colo. Fm. Home Res. 1956 : **6** : No. 6 : 5–6, 11–12.

Data are given on the grain yield per acre of 25 hybrids and varieties in trials at two localities in 1955.

559 KRISHNASWAMY, N., RAMAN, V. S. & CHANDRASEKHARAN, P.
An interspecific hybrid of grain sorghum and Johnson grass—*S. halepense* (2*n* = 20) x *S. roxburghii* (2*n* = 20).
Curr. Sci. 1956 : **25** : 195–97.

The F_1 hybrid from the above cross was meiotically regular, 10_{II} being formed. In some characters, such as spikelet size and grain shedding, the hybrid was intermediate; in other respects such as height and leaf length it showed transgression and in the remainder resembled one or other of the parents.

560 SWANSON, A. F.
Possibilities of sorghum production in Peru.
Spec. Rep. Progr. Coop. Exp. Agropec., Lima 1956 : No. 8 : Pp. 18. (Mimeographed).

The report includes information on trials of introduced varieties of grain and other types of sorghum.

RICE

561 **Rice variety for Missouri.**
What's New Crops Soils 1956 : **8** : No. 9 : p. 24.

The medium-grained variety Mo. R–500 has been released by the University of Missouri Agricultural Experiment Station. It is similar to Cody in yielding capacity but earlier ripening. It has given the best performance in northern Missouri; its milling qualities are good.

562 MISRA, G.
Photoperiodism in rice. VIII. Effects of short photoperiod on four varieties of early-winter rice.
Proc. nat. Inst. Sci. India 1955 : **21** : 201–09.

Week-old seedlings of T1145, T36, T23 and T17 were subjected to 10-hour photoperiods in the seed bed for periods of 3–6 weeks at the Botanical Laboratory of Allahabad University. Treatments of 3–6 weeks retarded ear emergence in T1145 and T23, the effect increasing with the length of treatment. Ear emergence in T36 and T17 was retarded by treatments of 3–5 weeks but with 6-week treatment retardation was shown by only 65% of T36 and 75% of T17. (Cf. *PBA*, XXVI, Absts. 2405 and 2407).

563 MISRA, G.
Photoperiodism in rice. IX. Response of an early variety of rice to long photoperiod.
Proc. Indian Acad. Sci. 1956 : **44** : 108–13.

Exposure of 10, 20 and 30-day-old seedlings of the early variety TN32 to photoperiods of 24 hours for one month resulted in a significant delay in ear emergence in all treated material. Plants treated at 20 days of age were similar in yield to the controls, while those treated at 10 days gave higher and those treated at 30 days produced lower yields.

564 **Report of the Conference of the Three Guianas and Venezuela on Agriculture and Forestry, Georgetown, British Guiana 1955** : Pp. 47.

The report includes a brief survey of rice breeding carried out so far in British Guiana, Surinam and Venezuela. The committee recommended that, in view of the similarity of agricultural conditions in Surinam and British Guiana, a coordinated breeding programme should be set up for these two countries.

565 MARIE, R.
Quelques résultats d'expérimentation rizicole. (**Some results of experiments on growing rice**).
Bull. tech. Ing. Serv. agric. 1956 : 223–28.

Notes on tillering, fertility, number of days to maturity, length of grain, 1000-grain weight, height of plant and susceptibility to lodging and shattering are presented for nine foreign introductions, mostly of Italian or Japanese origin, undergoing trials at the Le Merle experimental rice fields (cf. *PBA*, XXVI, Abst. 446). Balilla, a late-maturing, short-grained Italian variety possessing good resistance to lodging and giving high yields of grain of good quality, has been crossed with Sesia and Senatore Novelli with a view to improving its earliness and the length of its grain. Sesia has also been crossed with Maratelli with the object of obtaining an early-maturing, long-grained variety with short straw. Other crosses carried out have as their aim the development of early-maturing varieties combining high yields with resistance to lodging and shattering.

566 (**New varieties of rice, 1956. I**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : p. 45. [Japanese].

The following varieties have been released. Towada (= Norin 94 [Ministry of Agriculture and Forestry 94]) (Norin 17 x Tohan 3) is a productive midearly variety recommended for the northern parts of the Japanese mainland. Oirase (= Norin 95) (Tohan 2 x Fukoku [National Prosperity]) is a very early variety resistant to low temperatures. Yamatedori (= Norin 96) (Norin 6 x Ou 195) is an early midseason rice for elevated regions. Azusa (= Norin 97) (Norin 22 x Hokuriku 26) is a midseason type resistant to *Chlorops oryzae.* Fukusuke (= Norin 98) (Kinki 35 x Hokuriku 29) is a midearly variety with good ripening ability.

567 CHAVAN, V. M.
Paddy varieties that suit Gujarat.
Indian Fmg. 1956 : **6** : No. 5 : 33–35.

Promising strains have been isolated from a number of varieties grown in Bombay state and have undergone trials at a number of localities in the state. Details are given of the yield per acre and percentage increase over the local varieties. The most satisfactory strains were selected for further trial.

568 DEGRAS, M.
État actuel et perspective des recherches concernant les séries variétales en riziculture de Haute-Guinée. (**Present state and research prospects concerning the varietal series of rice grown in northern Guinea**).
Riz et Rizic. 1956 : **2** : 241–58.

The comparative merits of a number of local and newly introduced varieties appertaining to different botanical varieties are discussed with special reference to rice-growing conditions in the northern part of French Guinea. Preliminary breeding work at the Kankan Rice Experiment Station is also reviewed (cf. *PBA*, XXVI, Abst. 1322). Tau-binh C, Neang Rei and Neang Champa, all of which are floating, white-grained varieties of *Oryza sativa* recently introduced from Cambodia, have given good results.

569 UMALI, D. L., TORRES, J. P., HONRADO, P. A., MANIO, R. V. & RIGOR, E.
Cooperative rice improvement program in the Philippines.
News Lett. FAO Internat. Rice Comm. 1956 : No. 18 : 1–7.

A review is given of work carried out on upland and lowland rice since the initiation of the programme of improvement in 1952. Activities have included the evaluation of commercial varieties and subsequent purification and multiplication of those giving the most satisfactory performance; testing introduced varieties; selection of progenies from *indica-japonica* crosses made at Cuttack, India, in the FAO international scheme of hybridization; selection of the variety Wagwag; and hybridization of local types. Short-strawed high-yielding selections have already been developed from crosses at the Maligaya Rice Experiment Station.

570 PIACCO, R.
Un nuovo tipo di riso precoce: "Lomello".
(A new type of early rice: Lomello).
Riso, Milano 1956 : **5** : No. 7 : 12–13.

A further description is given of the variety referred to in *PBA*, Vol. XXVI, Abst. 2392, which has given good results on both light and heavy soils, with yields of grain varying from 55 to 65 c. per ha.

571 YAMAKAWA, Y. *ET AL.*
(On the new rice variety Nakasengoku).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1955 : **3** : 199–215. [Japanese].

Nakasengoku [Midseason Sengoku] was selected from the F_{10} of Tokaiasahi [Tokai Rising Sun] x Kinki 39. It is a midseason, disease-resistant variety with a high yield, suitable for northern Kyushu.

572 SUBRAMANYAM, K. N. & ROY, S. K.
Observations on inter-racial rice hybrids. The *japonica-indica* rice hybridisation.
J. Indian bot. Soc. 1956 : **35** : 158–64.

Observations are recorded on plant height, time taken from sowing to ear emergence, number of productive tillers, paddy and grain colour, the awned condition and other characters in the F_2 of Rikuu 132 x 141 BK, Norin 18 [Ministry of Agriculture and Forestry 18] x 36BK and Norin 18 x 141BK grown at the Agricultural Research Institute, Sabour, Bihar, from seed supplied by the Central Rice Research Institute, Cuttack, India, in accordance with the FAO cooperative scheme of *japonica-indica* hybridization and testing. The following observations are of particular interest. Time from sowing to ear emergence was inherited as a simple Mendelian character in Norin 18 x 36BK and Norin 18 x 141BK, with the later flowering of the *indica* parent dominant, and as a multifactorial one in the third cross. Fully developed awns or coloured grains appeared among a number of the segregates in each cross, although neither of these characters is shown by the parents. The percentage of empty spikelets among the hybrids varied from 0 to 100. Sterility bore no relationship with seed setting in the parents or with earliness of flowering in the hybrids. Plants were selected for their adaptability to heavy manuring; the F_3 obtained from these selections gave a good performance under such conditions.

573 MATSUO, T., FUTSUHARA, Y. & OSONE, K.
(Studies on the relation between differences in seed provenance and the characteristics of the unhulled rice grain).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **5** : 227–36. [Japanese].

The effect of provenance on grain size and growth in the subsequent generation was studied, using the varieties Norin 1 [Ministry of Agriculture and Forestry 1], Norin 36 and Kairyoaikoku [Improved Patriotic] grown at 25 localities. Seed size in the F_0 and vigour in the F_1 were affected by the conditions of growth in the F_0 generation but the effects did not persist further.

574 SHAMA RAO, H. K.
A combined technique for maceration and bleaching osmium blackening in root tips of *Oryza*.
Curr. Sci. 1956 : **25** : 191–92.

The following technique is recommended. Root tips are fixed in La Cour 2BE for 6–8 hr. The washed root tips are soaked in 1% aqueous solution of ammonium oxalate for 10–15 min. and are then bleached by adding a little 20-volume hydrogen peroxide, the intensity of reaction being controlled by dilution with 70% alcohol.

575 MASIMA [MASHIMA], I. & UCHIYAMADA, H.
(Studies on the breeding of highly fertile 4-ploid rices).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. Ser. D : 1955 : No. 5 : 104–36. [Japanese].

Autotetraploids of Japanese and introduced varieties pertaining to varietal groups I, II and III of Terao and Mizushima and of intragroup and intergroup hybrids between these varieties were obtained by colchicine treatment. Fertility of the autotetraploids was in the order: intergroup hybrids > intragroup hybrids > varieties. Fertility tended to improve in successive generations after colchicine treatment. Infertility was correlated with quadrivalent frequency, which was highest in the pure-variety autotetraploids.

576 FUKE, Y.
(On the genes responsible for differences in heading period in the principal Japanese rice varieties and on the relative response of these genes to temperature and day length).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. Ser. D : 1955 : No. 5 : 1–71. [Japanese].

Numerous crosses involving over 80 Japanese varieties have been made to elucidate the genetics of heading period. Six gene pairs are believed to be involved: *ZzMmKkGgOoFf*. *Z*, *M*, *K*, *G*, *O* and *F* determine lateness; *z*, *m*, *k*, *g*, *o* and *f*, earliness. *G*, *O* and *F* are dominant alleles; the heterozygotes of *Z*, *M* and *K* are intermediate. The effects of each gene on heading period are cumulative. *O* and *M* are linked with a cross-over value of 25%. *K* is linked to a gene determining red pigmentation in the glume tip.

Each of the above genes had a specific and cumulative effect on the alteration in heading period caused by culture under long or short days or under high temperatures. *Z*, *K* and *M* have a strong effect in curtailing heading period under short-day illumination; *G*, *O* and *F* react similarly under high temperatures.

577 FUKE, Y.
(On the genetics of photoperiodic reaction in rice).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. Ser. D : 1955 : No. 5 : 72–91. [Japanese].

Further genetical studies are reported to ascertain the reaction to photoperiod of plants carrying various of the *Z*, *M*, *K*, *G*, *O* and *F* genes described in Abst. 576. It is concluded that, in the presence of *K*, short photoperiods cause a marked acceleration in heading date; *O* and *G* depress the accelerative effect of short photoperiods. *F* brings about marked delay in heading under long photoperiods. It is suggested that two alleles of *K* should be differentiated to account for the differences in degree of delay of heading under long photoperiods encountered in plants of genotype *GOFMK*.

578 FUKE, Y.
(On the linkage of genes controlling heading period in rice).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. Ser. D : 1955 : No. 5 : 92–103. [Japanese].

A linkage value of 12·5% has been calculated between genes *O* and *M*, described in Abst. 577, from the segregation data of three further crosses.

579 TANG, W.-T. & CHIANG, S.-M.
(Studies on the dormancy of rice).
Taiwan Tahsueh Nunghsuehyuan Yenchiu Paokao/Mem. Coll. Agric. Taiwan Univ. 1955 : **4** : 1–7. [Chinese].

The dormancy periods of a large collection of cultivated rice varieties were determined; the range was from 0 to 45 days. The longer dormancy periods were in tropical *indica* varieties. Coloured pericarp appeared to be associated with longer dormancy.

580 LIN, C.-I.
(Studies on germination in the ear in rice. I. Intervarietal differences).
Taiwan Tahsueh Nunghsuehyuan Yenchiu Paokao/Mem. Coll. Agric. Taiwan Univ. 1955 : **4** : 98–104. [Chinese].

Data on the percentage of ears in which germination occurred and on percentage germination of the grains after 3, 7 and 14 days under laboratory conditions are provided for a series of varieties from the USA, Japan, Taiwan, the Philippines, Indochina, India and Celebes.

581 OKA, H.
(The polygenic nature of the gametic-development genes controlling intervarietal hybrid sterility in rice. Phylogenetic differentiation of cultivated rice. XII).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 51–55. [Japanese].

In extension of the conclusions reported in *PBA*, XXVI, Abst. 2411, the author finds that at least five sets of duplicate gene pairs are required to account for the genetics of hybrid sterility in the series of intervarietal crosses studied. Sterility of this sort disappears rapidly on inbreeding.

582 OKA, H.-I.
Variation in fertilizer response among rice varieties.
Chunghua Nunghsueh Hui Pao/J. agric. Ass. China 1956 : New Ser. No. 13 : 35–41.

The response of a series of Asiatic rice varieties to different levels of nitrogenous fertilizer was ascertained in Taiwan in 1947–49. The plant characters studied were number of tillers per hill, number of panicles per hill, plant height, panicle length, panicle weight, number of grains per panicle, 1000-grain weight and yield of grain per unit area. The best response to high levels of fertilizer was from *japonica* rices of the

Temperate Insular group. However, good response to fertilizer appears to be associated with inferior adaptability to high temperature.

583 ATKINS, J. G., BEACHELL, H. M. & CRANE, L. E.
Testing and breeding rice varieties for resistance to the straighthead disease.
Rice J. 1956 : **59** : No. 6 : 36, 38.

Breeding for resistance to the physiological disease straighthead is in progress in Texas. Varieties involving Fortuna, CI5094, Caloro or Lacrosse in their pedigrees have shown resistance.

584 BERNAUX, P.
La piriculariose du riz en France. (**Rice blast in France**).
Riz et Rizic. 1956 : **2** : 217–21.

Varietal differences in susceptibility to *Piricularia oryzae* in France were observed in trials at the Pathology Laboratory, Montpellier. Americano 1600, Senatore Novelli and Adelaide Chiappelli all proved resistant; the last-named variety, however, has been discarded because of its poor yields. Species with 48 chromosomes, such as *Oryza latifolia*, were found to be less susceptible than species with 24 chromosomes, such as *O. sativa* and *O. cubensis*.

585 LI, H.-C.
(**Differences in the resistance of Peng-lai rices to blast**).
Chunghua Nunghsueh Hui Pao/J. agric. Ass. China 1955 : New Ser. No. 11 : 84–89. [Chinese].

A series of rice varieties of the Peng-lai type were tested for resistance to *Piricularia oryzae* in 1952. The most resistant varieties were Pai-mi-fen [White Rice Powder], Kung-fu 1 [Chinese Revolution 1], Kao-hsiung 27 [Tall Virile 27], and Kao-hsiung 22.

586 **Blast resistant paddy.**
Indian Fmg. 1956 : **6** : No. 5 : p. 21.

A new rice variety, Culture 6538, has been produced in Madras from a cross between Co.4 and GEB 24. It is of medium maturation period, resistant to *Piricularia oryzae* and gives 22% higher yield than GEB24.

587 TSUTSUI, K., SATO, A., TANAKA, K., TANIMOTO, S. & ONOGI, S.
(**On damage due to the 1st generation of *Chilo simplex*. I**).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1955 : No. 2 : 76–103. [Japanese].

TSUTSUI, K., SATO, A., TANAKA, K., TANIMOTO, S. & ONOGI, S.
(**On damage due to the 2nd generation of *Ch. simplex*. I**).
Ibid. 1955 : No. 2 : 104–27. [Japanese].

These detailed studies of the behaviour of the above pathogen on various rice varieties include discussions on the nature of varietal resistance.

FORAGE GRASSES

588 SCHIEBLICH, J.
Futterpflanzenneuzüchtungen. III. Kanariengras und Roggentrespe. (**New strains of forage plants. III. Canary grass and *Bromus secalinus***).
Dtsch. Landw., Berl. 1956 : **7** : 383–87.

Bernburger [Bernburg] Canary grass, a new strain selected at the Bernburg Plant Breeding Institute, Eastern Germany, from material obtained from Gatersleben and various botanical gardens in different parts of Europe, gives high yields of fodder and seeds, grows rapidly and is resistant to lodging, shedding, mildew and rust. Suitable for cultivation with leguminous forage plants such as vetch and field peas, it has an erect growth habit, tillers profusely and may attain a height of 160 cm. under favourable conditions. Intended for cultivation as an annual, it is not winter hardy although tolerant of temperatures down to — 3° C. Altmark, a new cultivated variety of *B. secalinus*, was also developed at the above station from material from the same sources as Bernburger Canary grass. It is extremely winter hardy, gives high yields of fodder and seeds, tillers well and has an erect growth habit. It varies from 70 to 140 cm. in height and is suitable for cultivation with leguminous forage plants. As it is susceptible to mildew it should be grown as a winter or spring crop.

589 HUNT, I. V.
Comparative productivity of 27 strains of grasses in the west of Scotland. Part 2. Annual production during three years.
J. Brit. Grassl. Soc. 1956 : **11** : 174–81.

Details are given of the annual production of dry matter and crude protein of 27 grass strains (cf. *PBA*, XXVI, Abst. 3387) grown with white clover under conditions simulating hay production in the first year and grazing in the second and third years. The highest yields of dry matter were given by New Zealand perennial ryegrass in the first and second years and by tall fescue in the third year. In most grasses the yield fell off after the first year and only the cocksfoot strains S37 and S143 gave higher yields in the third year than in the first.

590 Malmqvist, L.
Prövning av vallväxtstammar. (**Testing of forage crop strains**).
Försök o. Forskn. 1956 : **13** : p. 77.

A new series of official trials of forage grasses and legumes was set up in 1954 in 25 localities throughout Sweden, 131 trials being laid out in 1954 and 143 in 1955. Mainly varieties that have already undergone two or three years testing are included in the trials, but local varieties are sometimes used as standards and some foreign varieties are also tested. Sweden is also participating in an international series of trials organized by the OEEC.

591 Hanson, A. A. & Carnahan, H. L.
Breeding perennial forage grasses.
Tech. Bull. US Dep. Agric. 1956 : No. 1145 : Pp. 116.

An extensive review has been undertaken by the authors, covering more than 300 publications, of general or particular application to the problems and methods of breeding forage grasses. The relevance to breeding of cytogenetics, including studies of apomixis and natural and induced polyploidy, is considered, and breeding objectives are discussed in some detail. Breeding procedures are outlined under the headings (1) selection of species, (2) source nurseries, (3) clonal evaluation, (4) ecotype selection, (5) mass selection, (6) maternal line selection, (7) controlled hybridization, (8) inbreeding and selection, (9) interspecific and intergeneric hybridization and (10) synthetic varieties; experimental techniques are described in detail. Suggestions are made of breeding programmes suitable for apomictic species, vegetatively reproduced species and cross pollinated species, and the multiplication, release and certification of new varieties is discussed.

592 Davis, R. L., Murphy, R. P., Burton, G. W. & Cowan, J. R.
Tomorrow's varieties of grasses and legumes.
What's New Crops Soils 1956 : **8** : No. 8 : 22–24.

The respective authors give brief reports on current breeding projects in the midwestern, eastern, southern and western states of the USA. Much of the work has been described elsewhere in *Plant Breeding Abstracts* but a few promising new varieties are mentioned, including the following. The timothy variety Essex, released in New York State, matures two weeks later than common timothy and is leafier and more resistant to leaf diseases. Saratoga, a brome grass also released in New York State, is superior to Lincoln in early spring growth, stand establishment and aftermath production and resists leaf diseases well. A new winter-hardy birdsfoot trefoil, Tana, with vigorous seedlings and rapid recovery after cutting or grazing, is being increased in Montana.

593 **Annual Report of Progress in Forage Crops Research in Oklahoma. Section I. Plant breeding, seed production and technology. 1955** :
Pp. 36. (Mimeographed).

Information is given on the performance of a large number of introductions of grasses and legumes. The chief breeding and cytogenetical work reported is referred to below:—

Andropogoneae. Continuation of the general survey of the above tribe resulted in information on chromosome numbers and meiotic behaviour in species of *Miscanthus*, *Erianthus*, *Spodiopogon*, *Microstegium*, *Ischaemum*, *Apluda*, *Hyparrhenia* and *Andropogon*. Detailed morphological and cytological studies were made of the following representatives of *Bothriochloa*: *B. ischaemum* complex ($2n = 40, 50, 60$); *B. intermedia* complex ($2n = 40, 60$); *B. pertusa* complex ($2n = 40, 60$); *B. radicans* ($2n = 40$); *B. decipiens* ($2n = 40$); *B. erianthoides* ($2n = 60$); and several New World species ($2n = 60, 80, 120, 160$) (cf. *PBA*, XXV, Abst. 3093 and XXVI, Abst. 2445). Other members of sect. *Amphilophiastrae* studied were: *Capillipedium parviflorum* and *C. spicigerum* (both with $2n = 40$); *Dichanthium annulatum* complex ($2n = 20, 40, 60$); *D. caricosum* complex ($2n = 40$); *D. sericeum* ($2n = 20$); *Euclasta* representatives ($2n = 40$) from tropical Africa; and *Eremopogon faveolatus* ($2n = 40$).

Seeds from crosses involving *Bothriochloa*, *Dichanthium* and *Capillipedium* were nearly all apomictic in origin.

It may be possible to induce variation in apomictic species of *Bothriochloa* and *Dichanthium* by X radiation but the influence of polyploidy and genetic unbalance upon the effects of radiation requires investigation.

Sand bluestem (*Andropogon hallii*) has so far proved to be the best of the native tall grasses, except in seed production. In selection emphasis is therefore being placed upon seed set and growth habit with respect to seed heads.

The perennial species *Sorghum propinquus* ($2n = 20$) from the Philippines has been crossed with *S. sudanense* 'Piper' with the aim of breeding a perennial type for grazing. The F_1

hybrid failed to flower in the field but seed was obtained under greenhouse conditions. The F_1 hybrid was meiotically regular. Another perennial type of sorghum, unlike any described species and originating from the Aravalli mountains of India, has a chromosome number of $2n = 40$. Crossing of this form, which is tufted, leafy and succulent, with *S. halepense*, *S. almum* and other species is in progress.

Panicum. *P. virgatum* 'Caddo' was released as a variety offering promise for use in the eastern districts of the southern Great Plains (cf. *PBA*, XXVI, Abst. 3410).

Bouteloua. *B. curtipendula* 'Coronado' was released (cf. *PBA*, XXVI, Abst. 3414).

Buchloe. Inheritance of sex expression in *B. dactyloides* is receiving attention.

Lucerne. A selection from a creeping wild Turkish population was crossed with an Italian hay type in the hope of combining vigour and creeping habit (cf. *PBA*, XXV, Abst. 3093).

594 STITT, R. E.
Yields of grass species and varieties under irrigation in Montana.
Bull. Mont. agric. Exp. Sta. 1955 : No. 508 : Pp. 38.

Details are given of the hay yield and pasture production of five strains of *Bromus inermis*, two of *Agropyron desertorum*, one of *A. cristatum*, three of *Phleum pratense*, three of *Poa pratensis*, five of *Dactylis glomerata*, two of *Phalaris arundinacea* and one each of *Festuca elatior*, *F. arundinacea* and *Arrhenatherum elatius*, studied under irrigated conditions at Bozeman, Mont., during the period 1945–48.

595 RAGONESE, A. E.
Mejoramiento de forrajeras en la Argentina. (**Improvement of forage crops in Argentina**).
Idia 1956 : No. 97 : Pp. 20.

Cereals. Improved varieties of wheat, rye, oats and barley for grazing purposes have been produced and are listed. Among them, the barley Araucana MAG and the rye Pico MAG are outstanding for their grain yield after grazing, the barley Negra Manfredi [Manfredi Black] for resistance to green aphid and the oats Santa Fe 3, Magnif 28 and Magnif 29 for resistance to all races of *Puccinia coronata* existing in South America; Magnif 29 is also resistant to *P. graminis*.

Grasses. Reference is made to improved selections of *Phalaris minor*, *Ph. tuberosa*, *Bromus catharticus*, *Dactylis glomerata* and *Lolium perenne*.

A sterile hybrid of *Phalaris tuberosa* var. *stenoptera* x *Ph. arundinacea* and a fertile amphidiploid from it are both being cultivated. Good results are reported from the hybrid *Lolium multiflorum* x *L. perenne* introduced from New Zealand.

Sorghum. Three Sudan grass selections superior in yield and tolerance of trampling are referred to, also three selections of *S. almum* free from rhizomes, an improved selection of sweet sorghum, Oliveros Carcarañá MAG, and some introduced varieties of sweet Sudan and *S. caffrorum*.

Lucerne. Improved types include the variety San Martín, which is resistant to stem eelworm (*Tylenchus dipsaci*), a selection resistant to an imperfect fungus causing root rot and several hybrids with improved forage-yielding capacity.

596 BRITTON, M. P. & CUMMINS, G. B.
The reaction of species of *Poa* and other grasses to *Puccinia striiformis*.
Plant Dis. Reptr. 1956 : **40** : 643–45.

The results are given of tests to find the reactions of varieties of 11 species of *Poa* and 9 species from related genera to *P. striiformis*.

597 ROBINSON, B. P. & LATHAM, J. M. (JUN.)
Tifgreen—a hybrid turf Bermuda-grass.
Mimeogr. Ser. Ga. agric. Exp. Sta. 1956 : No. N.S. 23 : Pp. 6. (Mimeographed).

This new hybrid is a selection from *Cynodon transvaalensis* x *C. dactylon* 'Charlotte Country Club'. In comparative trials with other Bermuda-grass strains, in which a number of characters making up desirable turf quality were studied, it was given a higher average rating in all cases.

598 GRISSOM, D. B. & KALTON, R. R.
Inheritance of combining ability for forage traits in bromegrass (*Bromus inermis* Leyss).
Agron. J. 1956 : **48** : 289–93.

Top-cross progenies of 18 S_0 clones and 10 S_1 selections from each were evaluated in sward plots for forage yield, spring vigour, reaction to leaf diseases and leafiness. The data indicated that combining ability is inherited and that segregation for this character occurs upon selfing. Heritability estimates for disease resistance, leafiness, spring vigour and forage yield were 16, 19, 46 and 48% respectively. The correlations between the performance of the top-cross progenies in sward plantings and that of the parental material in spaced and row plantings were low and variable. Combining ability with respect to forage yield and disease reaction was higher in the S_0 than in the S_1, the

S_1 progenies showing the greatest inbreeding depression tending to give the best top-cross performances.

599 **Report on a trial of strains of perennial ryegrass 1951 to 1954.**
Tech. Bull. Edinb. Coll. Agric. 1956 : No. 16 : Pp. 35.

Based on the results of a trial sown at Boghall, Edinburgh, in 1951 and harvested during 1952–54, a report on the total yields of dry matter, yields during different months, yields of crude protein and persistence of Ayrshire, Irish, Devon Eaver, New Zealand, Kent and S23 under high and low manurial treatments is presented.

600 SCHIEBLICH, J.
Futterpflanzenneuzüchtungen. II. Einjähriges Weidelgras. (**New varieties of forage crops. II. Annual ryegrass**).
Dtsch. Landw., Berl. 1956 : **7** : 326–29.

Bernburger Einjähriges Weidelgras [Bernburg annual ryegrass], bred at the Bernburg Institute of Plant Breeding, Berlin, is characterized by high tillering capacity, broad leaves, luxuriant leaf production, numerous heads, high seed yield, tall plant growth and rapid aftermath growth. Developed by crossing the Italian ryegrass Levsen with the annual ryegrass NFG, Bernburger is more winter-hardy than the latter parent and may be sown in autumn or spring.

601 NORSTOG, K. J.
Growth of rye-grass endosperm in vitro.
Bot. Gaz. 1956 : **117** : 253–59.

A tissue culture of the endosperm of *Lolium perenne* has been maintained *in vitro* for two and a half years. The meristematic cells usually contain the triploid number $2n = 21$, but larger cells which have differentiated into starch-storing ones often possess nuclei with higher numbers. Chromosome bridges have been observed in half the anaphase cells examined. Possibly bridge formation may lead to restitution nuclei in the starch-storing cells.

602 ESSAD, M. S.
Analyse cytogénétique de deux amphidiploïdes *Lolium perenne* L. x *Festuca pratensis* Huds. (**Cytogenetic analysis of two amphidiploids, *L. perenne* L. x *F. pratensis* Huds.**).
CR Acad. Sci., Paris 1956 : **243** : 670–72.

The progenies of crosses between *L. perenne* and *F. pratensis* displayed hybrid vigour but were pollen sterile. Two of the hybrids were treated with colchicine and gave rise to amphidiploids producing some fertile pollen. Cytological studies of the amphidiploids showed that meiosis was more regular than in the untreated hybrids. Selection for improved pollen fertility in the amphidiploids is being undertaken.

603 CROWDER, L. V.
Morphological and cytological studies in tall fescue (*Festuca arundinacea* Schreb.) and meadow fescue (*F. elatior* L.).
Bot. Gaz. 1956 : **117** : 214–23.

F. arundinacea and *F. elatior* showed significant differences in measurements of several morphological characters but similar differences were also found among selections within one species, among plants within a selection and within a single individual. The auricles of *F. arundinacea* were ciliate but those of *F. elatior* were not; it is suggested that this difference may be used in the differentiation of the two species. *F. arundinacea* had $2n = 42$ and *F. elatior* $2n = 14$; a few plants of each species had one or two accessories. Both species showed mostly bivalent pairing, with occasional univalents and multivalents. Measurements of morphological characters in the hybrids between the two species were either the same as in one of the parents or intermediate. All the hybrids were male sterile as the result of meiotic irregularities; the configurations observed at metaphase I indicated that the chromosomes of *F. elatior* paired with part of the genome of *F. arundinacea* and that the remaining chromosomes of the latter species paired among themselves.

604 AMBASTHA, H. N. S.
Cytological investigations in *Phalaris*.
Genetica 1956 : **28** : 64–98.

Ph. aquatica, *Ph. coerulescens*, *Ph. paradoxa*, *Ph. caroliniana*, *Ph. angusta* and *Ph. pratensis* had a haploid chromosome number of 7. The first two of these species contained no J or I shaped chromosomes but the remaining four possessed both types. Species with $n = 14$ fall into three groups: (1) the autotetraploids *Ph. minor* and *Ph. nodosa*, with two chromosomes having secondary constrictions; (2) the allotetraploids *Ph. arundinacea* and *Ph. tuberosa*, with two chromosomes having secondary constrictions; and (3) the allotetraploid *Ph. californica* having only one chromosome with a secondary constriction. The remainder of the 14 species studied had $n = 6$ and consisted of two groups: (1) *Ph. brachystachys* and *Ph. canariensis* with I shaped chromosomes and (2)

Ph. truncata without such chromosomes. The investigations indicated that the gradual accumulation of structural changes and reduction and doubling of chromosome numbers have been responsible for the evolution of the various species.

605 Carnahan, H. L. & Hill, H. D.
Cytogenetics of progenies of 35-chromosome reed canarygrass (*Phalaris arundinacea* L.).
Agron. J. 1956 : **48** : 356–59.

The chromosome numbers of progenies of three clones with $2n = 35$, which were planted in a polycross nursery together with a 28-chromosome clone, ranged from $2n = 28$ to 56, 66% of the progenies possessing more than 35 chromosomes. With few exceptions, progenies of the hexaploids and octoploids had the respective parental number of chromosomes, in spite of the fact that the hexaploids exhibited considerable meiotic irregularity and the octoploids even greater irregularity. Chromosome number was not correlated with leaf width but was correlated with date of anthesis. The hexaploids set a considerable amount of seed but the octoploids were much less fertile. Seeds of the hexaploids and octoploids were generally heavier than those of the tetraploids. The leaves of the tetraploids tended to be a darker green than those of aneuploids.

606 **New Hegari adapted to combine harvesting.**
Seed World 1956 : **78** : No. 11 : p. 70.

Combine Hegari, a new dwarf sorghum adapted to combine harvesting, is being released by the Texas Agricultural Experiment Station. It resembles ordinary Hegari in its yield, growing period, day-length requirements and high palatability but is more resistant to frost. Its complex parentage includes a number of Hegari strains and Double Dwarf Yellow Milo, from which it has received its gene for dwarfness.

607 Mehra, K. L.
Chromosome numbers in the tribe *Andropogoneae Gramineae.*
Indian J. Genet. 1955 : **15** : p. 144.

The following chromosome numbers were ascertained at the Indian Agricultural Research Institute, New Delhi: *Amphilophis odorata*, $n = 20$; *Andropogon gayanus*, $n = 20$; *A. ischaemum* from the USA, $n = 20$; *A. ischaemum* of Asian provenance, $n = 25$; *Capillipedium hugelli*, $n = 20$; *Dichanthium annulatum* from Belatal, India, $n = 10$; *D. annulatum* from Delhi, India, $n = 20$; *Hyparrhenia rufa*, $n = 20$; *Sehima nervosum* from Australia, $n = 10$; *S. nervosum* from Nagpur, India, $n = 20$; *Themeda anthera* from Kangra, India, two forms, $n = 10$ and 11 respectively; *Th. quadrivalis*, $n = 20$; *Th. tremula*, $n = 40$.

608 Adati, S. & Mitsuishi, S.
(Studies on breeding forage crops from wild Japanese grasses. I. Caryological studies of *Miscanthus*. 1).
Mie Dagaku Nogakubu Gakujutsu Hokuku/Bull. Fac. Agric. Mie Univ. 1956 : No. 12 : 1–10. [Japanese].

A collection of some 600 strains, principally from Japan, has been made. Data on chromosome number and, in some cases, on meiotic configuration are provided. The somatic chromosome numbers of the species are as follows: *M. sinensis*, 38 or 57; *M. pycnocephalus*, 38; *M. japonicus*, 38; *M. oligostachyus*, 38; *M. sacchariflorus*, 57 and 76; *M. hackeli*, 76; *M. ogiformis*, 57; and *M. tinctorius*, 38.

609 Gould, F. W.
Chromosome counts and cytotaxonomic notes on grasses of the tribe Andropogoneae.
Amer. J. Bot. 1956 : **43** : 395–404.

"A total of 170 chromosome counts are reported for 43 species and varieties of *Andropogon* and for 13 species of related genera. The counts were from P.M.C. smear preparations. Counts of $n = 10$ were obtained for plants of 18 taxa, $n = 20$ for 16 taxa, and $n = 30$ for 11 taxa. For convenience a basic number of 10 has been assumed for this series. Other counts in *Andropogon* were $n = 16$, 18, 21, 25, 40, 60 and 90. Counts in genera other than *Andropogon* were $n = 10$, 11, 15, 20, 30 and 35–40. Two different chromosome numbers are reported for six species of *Andropogon* (*A. annulatus*, $n = 10$ and 20; *A. intermedius*, $n = 20$ and 30; *A. pertusus*, $n = 20$ and 30; *A. ischaemum*, $n = 20$ and 25; *A. saccharoides*, $n = 30$ and 60; and *A. gerardi*, $n = 30$ and *ca.* 42–43). Two numbers are also reported for *Heteropogon contortus* ($n = 30$ and 35–40) and *Hyparrhenia hirta* ($n = 20$ and 30). Highly irregular pollen meiosis was observed in *Andropogon hirtiflorus* and *A. wrightii*, and forms of *Andropogon gerardi* and *Heteropogon contortus*. Cytological differences in the New and Old World taxa of *Andropogon* subgenus *Amphilophis* were noted. Considerable difference in chromosome size was found in the taxa referred to *Andropogon* but much greater differences were noted in species of the related genera. There was no obvious correlation between chromosome size and number. *Ischaemum glaucostachyum* had the smallest chromosomes and *Elyonurus barbiculmis* the largest. Both are diploids ($n = 10$)."

[Author's summary].

610 McMillan, C.
Nature of the plant community. II. Variation in flowering behaviour within populations of *Andropogon scoparius*.
Amer. J. Bot. 1956 : **43** : 429–36.

Clones of *A. scoparius* representing five community sites over a broad habitat gradient in Nebraska were grown in the greenhouse under conditions of controlled light periods and in a uniform garden at the Nebraska Agricultural Experiment Station, Lincoln. In addition, clones representing one population from an abruptly varying habitat forming a restricted community area in Iowa were exposed to different light periods. The differences observed in the flowering behaviour of the five populations from Nebraska could be correlated with the position of the populations in the habitat gradient across the state. As in the natural sites, the westernmost population was earlier flowering in the garden than the easternmost. Observations on the clones grown in the garden suggested that temperature as well as day length may be important in influencing time of flowering. Variation in the photoperiodic response of the clones derived from the loess slope constituting the Iowa site showed some correlation with place of origin on the slope.

611 Allen, G. H.
A new buffel grass for Queensland farmers.
Qd. agric. J. 1956 : **82** : 187–88.

A strain of buffel grass (*Cenchrus ciliaris*) introduced from Tanganyika has been released under the name of Biloela for use in certain districts of Queensland. High in protein content, the strain shows good long-season productivity and highly satisfactory early-spring growth. Its slightly rhizomatous habit renders it hardy under dry conditions.

612 Beetle, A. A.
Wheatgrasses of Wyoming.
Bull. Wyo. agric. Exp. Sta. 1955 : No. 336 : Pp. 24.

The twelve native and introduced species of *Agropyron* occurring in Wyoming are described, illustrations and comments on the uses of each being provided.

613 Hodgson, H. J.
Cytology, morphology, and amino acid characterization of a putative Agroelymus and its presumed parents.
Iowa St. Coll. J. Sci. 1956 : **30** : p. 383. (Abst.).

Putative hybrids ($2n = 28$) between *Elymus canadensis* ($2n = 28$) and either *Agropyron repens* or *A. sericeum* ($2n = 28$) were found at Palmer, Alaska, and were characterized by a high degree of sterility and extremely irregular pollen meiosis. Since the hybrid resembled *A. sericeum* more closely than *A. repens*, both morphologically and in aminoacid composition, the former species is regarded as one of the parents. Growth was more rapid and luxuriant in the hybrid and more flowering culms were produced than in either parent. No F_2 or backcross progeny was obtained and attempts to synthesize the hybrid failed, but amphidiploid seed has been produced by means of colchicine treatment.

614 Sarkar, P.
Crested wheatgrass complex.
Canad. J. Bot. 1956 : **34** : 328–45.

Morphological and cytological studies were made of the five species *Agropyron cristatum*, *A. pectiniforme*, *A. desertorum*, *A. michnoi* and *A. sibiricum*, as defined by Nevski. All the material had $2n = 28$, with the exception of a type usually referred to as *A. cristatum* 'Fairway', which had $2n = 14$; this taxon was also morphologically distinct from the other grasses studied and is assigned to a new species, *A. cristatiforme*. The caryotype of *A. cristatiforme* is described. Meiosis in this species was generally regular although an appreciable number of cells showed $6_{II} + 2_{I}$ at metaphase I. *A. sibiricum* and *A. michnoi* both showed a high frequency of multivalents, suggesting that these two species are of autoploid origin.

615 **Some characteristics of an annual wheatgrass.**
Agron. J. 1956 : **48** : 321–22.

The morphology and germination requirements of *Agropyron triticeum* are briefly described. Its ability to persist and spread under conditions of drought may make this species of value for breeding.

LEGUMINOUS FORAGE PLANTS

616 LARSEN, K.
Chromosome studies in some Mediterranean and south European flowering plants.
Bot. Notiser 1956 : **109** : 293–307.

New chromosome determinations made in this study include *Hippocrepis bicontorta*, $2n = 14$, *Onobrychis arenaria*, $n = 14$, and *Trifolium stellatum*, $2n = 14$.

617 FISCHER, H. E.
Die Wirkung von Acenaphthen auf die Leguminosen. (**The effect of acenaphthene on the Leguminosae**).
Z. Pflanzenz. 1956 : **36** : 81–116.

The effect of acenaphthene on mitosis in the root-tip cells and apical meristem cells of *Vicia faba*, *Pisum sativum*, *Phaseolus vulgaris*, *Glycine soya*, *Lupinus albus* and *L. luteus* was studied, using the sodium salt of hexanitrodiphenylamine, a known c-mitotic agent causing spindle disturbances in all the above species, as control. Spindle disturbances and other mitotic abnormalities such as multipolar anaphases were frequent and pronounced in *L. albus* and *L. luteus*; *G. soya* and *Ph. vulgaris* were also affected but to a lesser degree than *L. albus* and *L. luteus*. The cells of *P. sativum* and *V. faba* proved immune but their resistance was weakened by the addition of alcohol to the acenaphthene, multipolar anaphases and caryomeres then occurring. In those species affected by acenaphthene, the spindle disturbances were accompanied by root swelling and retardation of growth. Further studies of 56 species of leguminous plants showed that the members of some systematic groups, e.g. the Mimosaceae, Vicieae and Genisteae, reacted uniformly to treatment with acenaphthene but that, in general, there was no connexion between reaction to acenaphthene and the systematic position of any genus within the Leguminosae. Naphthalene and γ-hexachlorocyclohexane were found to exercise the same effect upon mitosis as that caused by acenaphthene.

618 SWANSON, A. F.
Alfalfa production in Peru.
Spec. Rep. Progr. Coop. Exp. Agropec., Lima 1956 : No. 7 : Pp. 11. (Mimeographed).

Information is given on types and varieties of Peruvian lucerne and also on the performance of varieties introduced from the USA in trials in which the Peruvian varieties Huaylas, Paray and San Pedro constituted the controls.

619 PANELLA, A.
Per il miglioramento genetico della medica. (**The genetic improvement of lucerne**).
Sementi elette 1956 : **2** : No. 5 : 18–29.

A report is given on the behaviour of 23 varieties of lucerne introduced from the USA as being of possible value for growing in northern, central and southern Italy respectively. They were compared with an Italian variety, Nostrale Umbra [Local Umbrian] and with *Medicago falcata*. The most rapid development of the stems was observed in Du Puits, the slowest in *M. falcata*, whilst Nomad and other slow-growing varieties produced the longest roots and are hence considered the most suitable for arid conditions. The highest average yields of green matter were obtained from Du Puits, Peruvian and San Martin in the three years 1953–55 at Perugia in central Italy but none of them was conspicuously better than the local type. The varieties African, Indian San Martin and Semipalatinsk, together with *M. falcata*, displayed resistance to both rust and mildew. Some 690 single-plant progenies are now under observation with the object of selecting suitable lines for making polycross hybrids.

620 BRITTEN, E. J.
Alfalfa production and breeding.
Hawaii Fm. Sci. 1956 : **5** : 1, 6–8.

At the present time considerable amounts of lucerne for fodder are imported into Hawaii from the USA; in this article the desirability of breeding varieties adapted to local conditions is discussed. The main objectives in such a breeding programme are persistence, resistance to diseases, especially root-rotting organisms, and resistance to insects and nematodes. A stand of lucerne that has persisted in the territory for over ten years has been located and these plants may provide valuable material for future breeding programmes. In addition it is thought that American varieties such as Lahontan, Rhizoma and Nomad may be worth testing as to their suitability for cultivation in Hawaii.

621 SPRAGUE, E. W.
Cytological, genetical and fertility relationships of three diploid *Medicago* species—*M. sativa*, *M. falcata* and *M. gaetula*.
Diss. Abstr. 1956 : **16** : Publ. No. 16,263 : p. 623.

The genomes of the above $2n$ species showed complete homology in crosses involving two or all three species. The somatic chromosomes of the three species were morphologically identical, one pair of chromosomes in each possessing satellites. Average ratings for self and cross fertility in the species and bispecific and trispecific hybrids were approximately similar. Variation in fertility among the plants of each group was high and probably genetically controlled. No relationship was detected between fertility and production of normal pollen. The conclusion was reached that the three species are representatives of a single polymorphic species.

622 Godeck, W.
Información preliminar sobre autofecundación en alfalfa. (**Preliminary information on self fertilization in lucerne**).
Idia 1956 : No. 98 : 27–29.

Marked loss of vigour was observed in most of the 35 lines on selfing and only 17 of them survived to the third generation; one line however proved self fertile. Those lines which persisted to the third generation were intercrossed without emasculation; some of them proved female sterile and some poor pollen parents. A comparison of the 91 hybrid combinations obtained showed at least 10 of them to be superior to the hybrid Magnif F in vigour.

623 Böjtös, Z.
A lucernanemesítés módszertani kérdései. I. (**Questions on methods of breeding lucerne. I**).
Martonvásár. növényterm. Kutató Int. Évkön. 1950 (1952) : **1** : 13–31.

With the ultimate aim of producing synthetic varieties and F_1 hybrids from self-sterile parents, work on self and cross fertility has been begun at Martonvásár, Hungary. Populations in which the proportion of cross pollination was high produced a higher number of seeds per pod than populations which were largely self fertilized. In a selfed population of 1817 individuals, the average number of pods developed from 100 flowers was 45·8 and the percentage of highly self-sterile plants was 15·1%. Self sterility increased with inbreeding, about 58·6% self-sterile plants being found in I_2 populations. Self-sterile individuals varied greatly in cross fertility, and studies of combining ability are now in progress.

624 Lesins, K.
Somatic flower color mutations in alfalfa.
J. Hered. 1956 : **47** : 171–79.

Investigations were carried out on the following four cases of mutant flowers: (1) a yellow-flowered branch (219–53 yellow) appearing on a greenish-flowered artificial tetraploid ($2n = 32$) of *Medicago sativa* x *M. falcata*; (2) a yellow-flowered form (No. 34 yellow) arising as a branch of a plant in the progeny of the mother plant of mutant (1) x a white-flowered selection of cultivated lucerne; (3) a single white flower observed in a raceme of purple flowers borne by a diploid derived from a cross between a slightly pinkish-flowered individual of *M. hemicycla* and an ivory-flowered F_2 plant of *M. sativa* x *M. falcata*; and (4) a yellow-banded green flower appearing on a green-flowered hybrid of *M. falcata* x a haploid of Grimm ($2n = 16$). In mutant (1) loss of anthocyanins was associated with undeveloped pistils, pod abscission and embryo abortion. Data on inheritance of flower colour and transmission of chromosome number suggested that mutants (1) and (2) were periclinal chimeras. Histological analysis supported this hypothesis, the pigment being situated in the epidermis of the petals. The chromosome number of these mutants and their mother plants was $2n = 31$. The root tips of the mutant (2) and its mother plant showed disturbances in about 19% of the anaphase cells; such disturbances may have been responsible for all four cases of mutation, by causing loss of a chromosomal segment involved in the inheritance of anthocyanin production. Paper-chromatographic analysis revealed that four or five anthocyanins had been lost through mutation. It is postulated that mutants (1), (2) and (4) lacked a complex factor *B* for the production of several anthocyanins and that mutant (3) lacked *B* or a factor *A* for the synthesis of an anthocyanin precursor.

625 Adams, M. W.
Creeping alfalfa.
S. Dak. Fm. Home Res. 1956 : **7** : 74–77, 85.

Selection for greater root proliferation, improved hardiness and resistance to rust and common leaf-spot at the Range Field Station, Cottonwood, S. Dak., is described. The plant material being used is derived from stock introduced into South Dakota from Siberia at the beginning of this century. It has proved well adapted for grazing purposes on the prairies and pastures of the northern plains of South Dakota and the new lines now being developed should prove valuable in areas subject to extremes of cold or drought.

626 Stanford, E. H.
Aphid resistant alfalfa plants.
Calif. Agric. 1956 : **10** : No. 7 : p. 3.

C–84 and C–89, components of the synthetic Lahontan which possesses resistance to spotted alfalfa aphid (*Therioaphis maculata*) as well as to stem nematode and bacterial wilt (cf. *PBA*, XXVI, Abst. 2465), has been used to introduce resistance to the former pest into Africa, the variety best adapted in the arid valleys of southern California. Some F_1 plants have retained the aphid resistance of the donor parents and are nearly similar to Africa in winter growth habit; they are to be back-crossed to Africa. Aphid resistance is also to be transferred from components of Lahontan to Caliverde.

627 HARVEY, T. L. & HACKEROTT, H. L.
Apparent resistance to the spotted alfalfa aphid selected from seedlings of susceptible alfalfa varieties.
J. econ. Ent. 1956 : **49** : 289–91.

At the Fort Hays Branch Experiment Station, Kansas, elimination of plants susceptible to the spotted alfalfa aphid (*Therioaphis maculata*) by testing at the seedling stage proved to be successful, a low percentage of apparently resistant individuals being obtained from Buffalo and other susceptible varieties. Determination of host reaction and aphid populations after infestation with 50–100 aphids one week after seedling emergence was the most practical method. A test of the selections in the greenhouse at a later stage showed that the degree of resistance varied from plant to plant but that individuals with resistance equal to that of plants of the resistant control Lahontan had been selected. Tests are to be carried out on the selections under field conditions and on their progenies.

628 WEBER, V.
Organisace zjišťování a množení krajových odrůd jetelů. **(Organizing the determination and propagation of the land varieties of clover).**
Za socialist. Zeměd. 1956 : **6** : 463–65.

A number of productive land varieties of red clover from the districts served by the Sobětice research station in Yugoslavia are described. They are characterized by hardiness, earliness and resistance to pests, diseases and drought.

629 SCHEIBE, A. & BRUNS-NEITZERT, A.
Das genetische Verhalten einer kurzröhrigen Mutante von *Trifolium pratense.* **(The genetical behaviour of a mutant of *T. pratense* with a short corolla).**
Züchter 1956 : **26** : 153–55.

Studies of the F_1 and F_2 of the white-flowered mutant with a short corolla tube (cf. *PBA*, XXV, Absts. 2100–1) obtained at the Max Planck Institute for Breeding Research, Neuhof, Germany, by X irradiation of dry seeds of Lembkes Rotklee [Lembke's Red Clover] showed that the character short corolla tube was determined by a single recessive gene. Flower colour was inherited on an intermediate basis and appeared to be determined by a series of polygenes; in addition to plants with red and white flowers, a number of pink-flowering forms were observed in the F_2. The characters short corolla and white flower were inherited independently.

630 BREWBAKER, J. L. & CARNAHAN, H. L.
Leaf marking alleles in white clover.
J. Hered. 1956 : **47** : 103–04.

Inconsistencies in the nomenclature of the *V* alleles governing leaf markings (cf. *PBA*, XXIII, Abst. 1273 and XXV, Absts. 475–6) have led to the adoption of the symbols listed below. The symbols enclosed in brackets are those given in *PBA*, XXV, Absts. 475 and 476 respectively. The recessive *V* gives no markings; V^{h} (V^{h},V^{H}) gives a full V, high; V^{i} (not previously described in *PBA*), a full V, intermediate; V^{l} (V^{l}, V), a full V, low; V^{b} (V^{b}, V^{Bh}), a broken V; V^{bd} (—, V^{B}), a broken V, dominant (so called because of its dominance over V^{P}); V^{p} (V^{P}, V^{P}), a V-point; V^{f} (V^{wi}, V^{F}), a filled V; V^{ba} (—, V^{L}), a basal V; V^{by} (V^{by}, —), a broken V with a yellow tip; and V^{tg} (not previously described), a filled V with a green base.

631 ARMSTRONG, J. M. & ROBERTSON, R. W.
Studies of colchicine-induced tetraploids of *Trifolium hybridum* L. I. Cross and self-fertility and cytological observations.
Canad. J. agric. Sci. 1956 : **36** : 255–66.

Tetraploid seed from colchicine-treated plants was grown and selected for fertility through successive generations until, in the F_7, the population equalled diploid material in number of seeds per head, although remaining slightly below the diploid level in number of seeds per floret. Self fertility was appreciably higher in the tetraploids than in diploids, but progenies of self-fertile plants showed a reduction in self compatibility compared with the parents. Tetraploids were not cross compatible with diploids. Quadrivalents were frequent in the tetraploids but separated regularly at anaphase and no association was observed between meiotic behaviour and fertility. The evidence suggested that fertility was largely genetically controlled.

632 MILLINGTON, A. J.
Subterranean clover strain breeding for the wheatbelt of Western Australia.
J. Aust. Inst. agric. Sci. 1956 : **22** : 111–19.

Work in Western Australia on breeding varieties of subterranean clover suitable for cultivation on the lateritic sand-plain soils of the wheat belt is summarized. The main object is to obtain early-maturing, drought-resistant forms giving high yields of green fodder and seeds, the seed burrs being set above ground rather than below it. Some of the F_2 and F_3 plants of crosses carried out between Yarloop and Burnerang, the former an early-maturing spreading type and the latter a late-maturing strain with very erect growth, combined the erect growth and formation of burrs above the ground of Burnerang with the comparatively early maturity of Yarloop. To improve earliness still further, these hybrids were then crossed with Morocco, Dwalganup and a Dwalganup x Red Leaf hybrid. Among the progenies of this second series of crosses, some plants were found in which the association between earliness and woody stems, especially notable in varieties such as Morocco, had been broken. The variety Geraldton is also mentioned as a possible source of valuable germplasm; this form flowers 1–2 days later than Dwalganup but matures 7–10 days earlier as the seed burrs develop much more rapidly. The period during which seed set is most likely to be adversely affected by drought is thus reduced. Genetical studies indicated that the erect growth habit of Burnerang was determined by a single recessive gene. Male sterility is also controlled by a single recessive gene. Multiple leaflets and red leaf, two characters of possible value as markers, are determined by a single recessive gene and by a single dominant gene respectively.

633 ERDMAN, L. W. & MEANS, U. M.
Strains of rhizobia effective on *Trifolium ambiguum*.
Agron. J. 1956 : **48** : 341–43.

Strains of rhizobia derived from soil samples and nodules on *Trifolium* spp. from Turkey have proved to be effective in inoculating *T. ambiguum*, a species which has not shown effective nodulation when grown in the USA. Two strains, 3D1Y8 & 3D1Y8 (b), were significantly more effective than the others.

634 YITZCHAKI, D.
(Recognizing cultivated vetch in Israel).
Sadeh (Field)/Hassadeh 1956 : **36** : 112–14, 221–23. [Hebrew].

Some types of *Vicia sativa* and *V. angustifolia* which grow wild in Israel are described. No clear-cut differences between the two species have been found. There were wide differences between strains in earliness, erectness of growth, vigour of initial growth, and degree of shattering. The plants are self-fertilized in the bud when the corolla attains half its final length.

Two of the strains have been crossed. The F_1 flowered as late as the later-flowering parent. It had only 1–2 seeds per pod, while both parents had 8–10.

635 HANSON, C. H., ROBINSON, H. F. & COMSTOCK, R. E.
Biometrical studies of yield in segregating populations of Korean lespedeza.
Agron. J. 1956 : **48** : 268–72.

The F_3 and F_4 progenies of 284 randomly selected F_2 families from three different crosses were studied with respect to heritability and genetic and environmental variance in vigour, seed yield and total seed and forage yield at two localities in North Carolina. Genotype x year interactions were large. Heritability of seed yield was generally higher than that of total seed and forage yield, which in turn was higher than that of vigour. The values for heritability of vigour were lower for vigour scores obtained on 1 July than for those obtained on 1 August, and the accuracy of scoring for vigour appeared to be lower in populations segregating for a procumbent habit. Positive correlations were obtained between total yield and seed yield, total yield and vigour, and seed yield and vigour.

636 HANSON, C. H. & COPE, W. A.
A dwarf mutation in sericea lespedeza.
J. Hered. 1956 : **47** : 155–56.

The occurrence of a dwarf mutant of *Lespedeza cuneata*, believed to be due to a single recessive gene, is reported.

637 GOPLEN, B. P., GREENSHIELDS, J. E. R. & WHITE, W. J.
Selection techniques in screening for coumarin-deficient sweet clover plants.
Canad. J. Bot. 1956 : **34** : 711–19.

A rapid and effective qualitative procedure for detecting coumarin-deficient plants is described.

Fresh young leaves, which are richer in coumarin than other plant parts, are stored in 2·5 N NaOH at room temperature in the dark and when required are examined for fluorescence under ultraviolet radiation. Material which had been dried or stored in the light showed a loss of coumarin and gave unreliable results.

638 Gershoy, A.
Mansfield. A new trefoil for Vermont.
Vt. Fm. Home Sci. 1956 : **1** : No. 4 : 3–4, 15.

Mansfield, a new variety of birdsfoot trefoil developed at the Vermont Agricultural Experiment Station, is characterized by its large leaves, which are dark green to bluish green in colour, and by its early maturity. It has thick, erect stems, gives high yields of good-quality fodder and is winter hardy. The best results are obtained on heavy, well-drained soils.

639 Larsen, K.
Cyto-taxonomical studies in *Lotus* III. Some new chromosome numbers.
Bot. Tidsskr. 1956 : **53** : 49–56.

In continuation of this series (cf. *PBA*, XXV, Abst. 483), chromosome numbers of the following species are reported: *L. campylocladus*, $2n = 14$; *L. coimbrensis*, $2n = 12$; *L. lancerottensis*, $2n = 14$; *L. palaestinus*, $2n = 14$; *L. parviflorus*, $2n = 12$; *L. peregrinus*, $2n = 28$; *L. purshianus*, $2n = 14$; *L. requienii*, $2n = 14$, 28; and *L. trigonelloides*, $2n = 14$. Chromosome numbers in the closely related genus *Dorycnium* were: *D. hirsutum*, $2n = 14$, 28 and *D. jordanii*, $2n = 14$. In neither *L. requienii* nor *D. hirsutum* were the intraspecific chromosome races distinguishable by any marked difference in morphology or distribution.

640 Solomon, S. & Shama Rao, H. K.
Pollination studies in the genus *Alysicarpus*.
Indian J. Genet. 1955 : **15** : 136-41.

The problem of finding leguminous forage plants suitable for cultivation with forage grasses in the tropical grasslands of India is discussed; the genus *Alysicarpus* contains several species that grow well in association with some of the more valuable Indian forage grasses. The mode of pollination under natural conditions was therefore studied in *A. rugosus* var. *styracifolius*, *A. bupleurifolius*, *A. vaginalis*, *A. pubescens*, *A. longifolius* and *A. rugosus* var. *heyneanus* prior to initiating a breeding programme. All the species studied were extremely variable in their morphological features and considerable differences in respect of plant height and period to maturity were noted within the same species. In the case of the first three species listed above, the stigmas and anthers of the flower were at the same level and spontaneous tripping and self fertilization were frequent; these species set pods freely without being visited by insects and did not appear to suffer any ill effects from inbreeding. The other three species, however, did not set pods in the absence of insects and, under natural conditions, were nearly always cross pollinated, although seed was set when the flowers were artificially self pollinated. As *A. rugosus* var. *heyneanus*, which belongs to the second group, is likely to be of considerable value in view of its high yields and resistance to grazing, the question whether repeated selfing will result in a loss of vigour requires careful investigation.

641 Datta, P. C.
Studies on the structure and behaviour of chromosomes of a few species of the genus *Lathyrus* as a means of detecting the interrelations.
Genet. iber. 1955 : **7** : 85–115.

Investigations on the caryotypes of *L. odoratus*, *L. aphaca* and three varieties of *L. sativus* are reported. Each species was found to have $2n = 14$ and four pairs of nucleoli, differences in the size of the pairs of nucleoli being noted in both *L. sativus* and *L. aphaca*. It is suggested that the species in question arose from a common stock with $x = 7$, *L. odoratus* and *L. sativus* being more closely related to each other than to *L. aphaca*. Differences in caryotype were found among the three varieties of *L. sativus*. Abnormalities such as inversion bridges, non-disjunction and lagging were observed in *L. sativus* and *L. odoratus*, the frequency of abnormalities and high percentage of pollen sterility being correlated with chiasma frequency. In *L. aphaca*, meiotic irregularities were absent and pollen sterility was negligible but the chiasma frequency was nevertheless high. It is suggested that *L. aphaca* has reached a stable cytological condition whereas cultivated species such as *L. sativus* and *L. odoratus* are much less stable as the result of repeated hybridization.

642 Našinec, J.
Svazenka vratičolistá (*Phacelia tanacetifolia* Benth.) a její šlechtění. (***Ph. tanacetifolia* Benth. and breeding it**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1956 : **29** : 59–68.

Breeding work on this melliferous forage plant, also valued as a green manure, at Větrov is discussed. Reduction in degree of pubescence and improvement in yield of green and dry matter are among the major breeding objectives.

ROOTS AND TUBERS

643 REITBERGER, A.
Ruhekernuntersuchungen bei gesunden und viruskranken Diploiden und Polyploiden von *Beta vulgaris*. (**Investigations of the resting nucleus in healthy and virus-infected diploids and polyploids of *B. vulgaris***).
Züchter 1956 : **26** : 106–17.

A rapid and reliable method of determining whether a given specimen of *B. vulgaris* is diploid, triploid or tetraploid is described. Devised at the Rosenhof Substation of the Max Planck Institute for Breeding Research, Germany, it consists of counting the number of nucleoli or trabant chromocentres in the epidermal cells of the leaf. Cells of diploid plants were found to have 1–2 nucleoli and 2 trabant chromocentres, triploids 1–3 nucleoli and 3 trabant chromocentres and tetraploids 1–4 nucleoli and 4 trabant chromocentres. Differences in the size of nucleoli and trabant chromocentres were due partly to the number of nucleoli present and the position of the trabant chromocentres relative to the nucleus membrane and were partly genetically determined. Crosses between plants with cells containing very small nucleoli and trabant chromocentres and plants with cells containing nucleoli and trabant chromocentres of normal size produced progenies in which the plants segregated in a ratio of approximately 1 : 1. Plants infected with beet yellows tended to have cells in which the nucleoli were larger than normal.

644 FISCHER, H. E.
Untersuchungen an Zwillingen von *Beta vulgaris* L. (**Investigations on twins in *B. vulgaris* L.**).
Züchter 1956 : **26** : 136–52.

The occurrence of identical and nonidentical twin plants in *B. vulgaris* is discussed. Of 232 twin plants of diploid varieties studied at the Kleinwanzleben Institute for Plant Breeding of the German Academy of Agricultural Sciences, Berlin, pairs of plants of which one plant was diploid and the other tetraploid, or one diploid and the other haploid, were found. Likewise, in twins of tetraploid parents, the occurrence of twins of which one was tetraploid and the other diploid was observed. A cross between diploid and triploid beets gave rise to a pair of identical twins that were pentaploid.

645 DONÀ DALLE ROSE, A.
Probabili relazioni tra pigmentazione ed infezione cercosporica in *Beta vulgaris*. (**Probable relationships between pigmentation and infection by *Cercospora* in *B. vulgaris***).
Nuovo G. bot. ital. 1954 : **61** : p. 716.

A correlation is reported between presence of anthocyanin pigmentation and susceptibility to *C. beticola* in sugar and forage beets and *B. vulgaris* x *B. maritima* progenies.

646 JÄHNL, G.
Ergebnisse der Rübenversuche des Jahres 1955. (**Results of beet trials during the year 1955**).
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1956 : No. 33 : Pp. 89.

Of the mangels tested, Kirches Koloss, Eckendorfer gelb [Yellow Eckendorf] and Zentaur [Centaur] gave the highest yields of roots and Groenkraag CB, Rosa Beta and Zentaur had the highest dry matter contents. Zentaur was slightly more resistant to *Cercospora beticola* than the other varieties. Among the sugar beets, Kleinwanzleben Polybeta produced the highest yields of roots, dry matter and sugar. Hoffmanns weisse Riesen [Hoffmann's White Giant] responded best to artificial irrigation.

647 PALMER, T. P.
Resistance of swedes to aphids. II. Distribution of aphids on swedes.
NZ J. Sci. Tech. 1956 : **38** : 30–33.

Varietal differences in susceptibility to *Brevicoryne brassicae* and *Myzus persicae* were observed in trials carried out in 1951 and 1953 by the Crop Research Division, Christchurch, NZ. Calder and Wilhelmsburgher Øtofte were less susceptible to *B. brassicae* than were Superlative or Grandmaster (cf. *PBA*, XXIII, Abst. 2776) and Wilhemsburgher Øtofte was less susceptible to *M. persicae* than Calder or Superlative. In all varieties the density of *B. brassicae* populations declined as the leaf grew older, this tendency being more pronounced in resistant than in susceptible varieties. The density of populations of *M. persicae* also declined with the age of the leaf but not to such a marked extent as with *B. brassicae*.

648 JAMALAINEN, E. A.
Onko Ranskasta opittavaa perunan viljelyn alalla? (**Is French potato cultivation being studied here?**)
Maatalous 1956 : **49** : 25–28.

A short review of potato cultivation in France and its organization is given. A list of varieties commonly cultivated in France with their salient properties is included.

649 Jähnl, G.
Ergebnisse der Kartoffelversuche des Jahres 1955. (**Results of potato trials during the year 1955**).
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1956 : No. 32 : Pp. 78.

The results of trials conducted to determine the comparative suitability of a wide range of varieties for cultivation in the Austrian Alps are presented. The information given, which is in tabular form, includes data on average yield, starch content and tuber size and on varietal differences in susceptibility to virus and other diseases. The order in which the varieties were placed in respect of yield varied according to locality but, in general, Sirtema and Maritta were the most productive of the early-maturing and late-maturing groups respectively.

650 Dőry, L.
Kétéves burgonyafajta-kísérlet tapasztalatai. (**Experiences gained from a two-year trial of potato varieties**).
Debrecen. Mezőgazd. Kísérl. Intéz. Évkön. 1950 : **1** : 11–26.

Among 40 varieties tested at the Debrecen Agricultural Experimental Institute, Hungary, in 1949 and 1950, Aranyalma [Golden Pippin], Mercur, Johanna, Ágnes and 249/41 gave the highest yields.

651 Ingebrigtsen, S.
Forsøk med potetsorter. (**Trials of potato varieties**).
Forskn. Fors. Landbr. 1956 : **7** : 459–76.

Details are given of the yield, tuber size, percentage of diseased plants and dry matter content of 20 potato varieties tested during the years 1945–54 at various localities in Troms, Norway. Arran Banner and Immun Keiserkrone [Immune Imperial Crown] gave the highest yields but were rather low in dry matter content. Up to Date, Arran Comrade and Sapa also produced high yields. Gullauge was best in table quality.

652 Aardappels, 1956 (Observatieproefvelden). [**Potatoes, 1956 (observation experimental fields)**].
Landbouwvoorlichting 13 : Bijl. 9; Ber. Rassenkeuze 1956 : No. 206 : Pp. 4.

Brief information on yield, maturity, quality, dry matter percentage and disease resistance is presented for some of the main varieties cultivated in the Netherlands, as well as for a number of new varieties undergoing their preliminary trials and a few recent introductions from abroad.

653 Aardappels, 1956 (Interprovinciale proefvelden). [**Potatoes, 1956 (interprovincial experimental fields)**].
Landbouwvoorlichting 13 : Bijl. 10 : Ber. Rassenkeuze 1956 : No. 207 : Pp. 6.

Data on maturity, starch and dry matter contents, yield per ha., disease resistance and quality of the tubers are presented for the main varieties cultivated in the Netherlands for home consumption and export and for fodder and industrial purposes.

654 **New varieties of potatoes.**
Potato News Netherlands 1956 : **6** : 6–8.

The new varieties Kwinta, Luctor, Pionier [Pioneer], Rival, Meerster [Sea Star] and White Ultimus are described (cf. *PBA*, XXVI, Abst. 2501).

655 Sheehan, J. E. & Odland, T. E.
A quarter century of potato variety trials in Rhode Island.
Amer. Potato J. 1956 : **33** : 161–65.

The results of trials carried out on named varieties during 1930–1954 are surveyed. Of the new varieties tested, Saco is considered to be the best in many respects, notably in its smooth cream-coloured skin and resistance to diseases (cf. *PBA*, XXV, Abst. 2189).

656 Anderson, W. S., Campbell, A. J., Murphy, B. C. & Watson, W. W.
LaSoda leads other Irish potato varieties in tests at four localities in State.
Miss. Fm. Res. 1956 : **19** : No. 3 : p. 3.

Trials at four localities for two years showed that LaSoda gives a consistently higher average yield, and Triumph a generally lower yield, than the other varieties tested.

657 Swaminathan, M. S.
Disomic and tetrasomic inheritance in a *Solanum* hybrid.
Nature, Lond. 1956 : **178** : 599–600.

Data from a cross between the $2n$ species *S. macolae* and *S. simplicifolium* indicated that their genotypes were respectively $LLwwPp$ and $llWWpp$; Ll governs compound *vs.* single leaf, Ww prominent *vs.* rudimentary stem wing and Pp purple *vs.* white corolla. No linkage was detected between L, P and W. The F_1 hybrid was meiotically regular. The fertile tetraploids obtained by colchicine treatment of the seeds of the initial cross had mean frequencies of $1{\cdot}19_{IV}$, $0{\cdot}095_{III}$, $21{\cdot}025_{II}$ and $0{\cdot}905_{I}$ per cell. The number of quadrivalents per cell ranged from 0 to 4. *L* segregated in a typical tetrasomic manner; data on the segregation of *W* and *P* in the tetraploids were indicative of preferential segregation of the chromosomes.

658 HAWKES, J. G.
Hybridization studies on four hexaploid *Solanum* species in series *Demissa* Buk.
New Phytol. 1956 : **55** : 191–205.

Crosses involving the wild Mexican hexaploid species *S. demissum*, *S. brachycarpum*, *S. guerreroense* and *S. spectabile* and the diploid *S. verrucosum* were attempted (cf. *PBA*, XXV, Abst. 2165). The self fertility of the parental species was high, except in line PC1349 of *S. verrucosum* which was male sterile. Seeds were obtained from the following crosses: *S. demissum* x *S. brachycarpum*, *S. guerreroense* x *S. brachycarpum*, *S. brachycarpum* x *S. spectabile* and the reciprocal, *S. guerreroense* x *S. demissum*, *S. guerreroense* x *S. spectabile*, *S. spectabile* x *S. demissum* and *S. verrucosum* x *S. spectabile*. The F_1 seed had in most cases a high germination percentage. The F_1 families each showed uniformity of vigour, habit, leaf type, flower form and flower pigmentation and were on the whole intermediate between their parents. Seedlings from crosses between the hexaploid species all had $2n = 72$. Two out of the three seedlings of *S. verrucosum* x *S. spectabile* obtained were examined cytologically; one was pentaploid and the other tetraploid. Self pollination and intersib crosses were attempted in all F_1 families but no seeds or berries were obtained except in the case of one intersib cross in *S. guerreroense* x *S. brachycarpum*. Reciprocal back crosses were only attempted with the *S. demissum* x *S. brachycarpum* family but without success. The percentage of stainable pollen in the F_1 individuals examined was low, ranging from 10 to 50%. Four seedlings were obtained from the cross (*S. demissum* x *S. brachycarpum*) x *S. tuberosum*; in three the chromosome number was $2n = 60$ and in the fourth $2n = 63$; back crosses to *S. tuberosum* were successful. The possible ancestry of the hexaploid species is discussed and it is pointed out that the sterility of the hybrids between them is sufficient for the species to be regarded as distinct.

659 BAMBERG, K. & RUSKA, A.
(The effect of chemical sorting of seed potatoes upon the tuber yield and quality).
Latv. PSR Zinãt. Akad. Vestis 1955 : No. 12 : 53–60. [Russian].

The results of research at Priekuli reported in *PBA*, XXVI, Abst. 3464 are supplemented by data obtained in 1954 and 1955 from the varieties Export, Agra and Priekuljskiĭ Ranniĭ [Early Priekuli].

660 SAVINSKAJA, N. V.
(A description of heterogeneity of the eyes in degenerate potato tubers).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1955 : No. 22 : 151–60. [Russian].

In Moscow, clones raised from different eyes of a tuber of some degenerate varieties originating from Odessa showed great variability with regard to productivity and vigour, each clone transmitting these characteristics to its tuber progenies. Different eyes from the same degenerate varieties originating from Moscow gave clones that were all characterized by a similar degree of degeneration.

661 CÁRDENAS, M.
Origen e historia de la papa. (**Origin and history of the potato**).
Téc. agropec., Lima 1956 : **2** : 36–40.

The opinion is expressed that the domestication of maize may have taken place before that of the potato, that *Solanum andigenum* is polyphyletic and that an important factor in the domestication of the potato was the loss of the bitter principle in the tubers, possibly by mutation. Several species belonging to the section *Commersoniana*, e.g. *S. vernei*, *S. caipipendense* and *S. cuevoanum*, are mentioned as having fairly large tubers and not being excluded as possible ancestors of domestic potatoes; the same applies to *S. violacimarmoratum* from section *Conicibaccata*.

662 BRÜCHER, H.
Kritische Betrachtungen zur Nomenklatur argentinischer Wildkartoffeln. I. Die Serie *Commersoniana*. (**Critical observations on the nomenclature of Argentine wild potatoes. I. The series *Commersoniana***).
Züchter 1956 : **26** : 97–106.

The author argues that German, English and Russian potato collecting expeditions to South America have frequently failed to recognize specimens as belonging to species that have already been named or have given specific status to interspecific hybrids. He claims further that the 24 species considered hitherto to constitute the series *Commersoniana* could be reduced to 4 or 5. *Solanum emmeae*, *S. horovitzii*, *S. knappei*, *S. parodii*, *S. schickii*, *S. jujuyense*, *S. setulosistylum* and *S. saltense* are considered to be biotypes of *S. subtilius* and not to merit specific status. This collective species, first described by Bitter in 1913, ranges from the northwestern tip of Argentina to the province of San Luís in central Argentina and the widely differing environmental conditions prevailing in this zone have proved particularly conducive to gene diversification and the development of biotypes.

663 AFANASJEVA, A. S. & NOVOŽILOVA, N. P.
(Multiplication of the cells in normally developing potato tubers).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1955 : No. 22 : 161–67. [Russian].

An amitotic mode of cell division in the tissues of potato stolons and tubers is described.

664 GILLES, A., DEVREUX, M. & LHOAS, P.
Recherches cytogénétiques sur les *Solanum*, section *Tuberarium*. III. Polyploïdisation expérimentale. **(Cytogenetical investigations on *Solanum*, section *Tuberarium*. III. Experimental polyploidization).**
Genetica 1956 : **28** : 42–50.

Two sets of experiments are described. In the first, dry and pregerminated seeds of *Solanum antipoviczii*, *S. verrucosum* and *S. longipedicellatum* were treated with colchicine solutions at different concentrations for varying periods to obtain information as to the best solution and most efficacious period of treatment for the induction of polyploidy. Treatment with a colchicine solution of 0·2% for 6 hr. in the case of pregerminated seeds and for 5–6 hr. in the case of dry seeds proved the most effective; concentrations of 0·6% and above had a lethal effect. In the second set of experiments, dry seeds of the varieties Katahdin and Flava of *S. tuberosum* were treated with a colchicine solution of 0·2% for 6–10 hr. The resulting octoploids had thick, dark-green leaves, a slow growth rate and a somewhat dwarf habit. They failed to flower and produced only a few small tubers.

665 GILLES, A.
Recherches cytogénétiques sur les *Solanum*, section *Tuberarium*. IV. Action des rayons X sur *Solanum acaule*. **(Cytogenetical investigations on *Solanum*, section *Tuberarium*. IV. Action of X rays on *S. acaule*).**
Genetica 1956 : **28** : 51–63.

At the University of Louvain, Belgium, pregerminated seeds of *S. acaule* were subjected to doses of 500–25,000 r. to obtain information on the radiosensitivity of *Solanum* spp. and its biophysical and biochemical aspects. Doses of below 2000 r. had little effect but in excess of this dose the percentage germination decreased with increased irradiation. In the groups treated with 10,000–25,000 r. many seedlings, although they germinated completely, failed to develop any leaves apart from the cotyledons; schizocotyly was observed in some cases in plants grown from seeds irradiated with 15,000–25,000 r. Development in the juvenile stage was retarded considerably, a positive correlation being established between the intensity of the dose given and the degree of retardation. Many plants had a dwarf habit and did not flower or produce tubers. However, one plant in the group that had been irradiated with 20,000 r. and two in the group that had been irradiated with 25,000 r. flowered profusely and produced a greater number of berries and seeds than the untreated control. Viable seeds were obtained from these plants.

666 FISCHNICH, O.
Keim- und Wachstumsbeeinflussung von Kartoffelpflanzgut durch chemische und physikalische Massnahmen. **(Influencing the germination and growth of seed potatoes by chemical and physical measures).**
Landbouwk. Tijdschr., 's-Grav. 1956 : **68** : 743–55.

The literature on ways of reducing the dormancy period in potatoes by treatment with chemicals (cf. *PBA*, XXIV, Abst. 3113) and by mechanical means (cf. *PBA*, XXIV, Abst. 1210 and XXV, Abst. 2160) is reviewed with reference to the author's work on the subject. In addition to being of value in accelerating breeding work, treatment with chemicals facilitates the varietal identification of potato tubers (cf. *PBA*, XXV, p. 456). The effect of temperature on germination is also discussed and varietal differences in the optimum storage temperatures for potatoes are noted (cf. *PBA*, XXVI, Abst. 2584).

667 SHARMA, K. N. & THOMPSON, N. R.
Relationship of starch grain size to specific gravity of potato tubers.
Quart. Bull. Mich. agric. Exp. Sta. 1956 : **38** : 559–69.

Specific gravity was related to the proportions of large and small starch grains with sizes above and below 75 and 25 microns respectively; the higher the proportion of large grains the higher was the specific gravity. The proportions of small and large grains were apparently a varietal characteristic.

668 ZAJÍC, J.
Výsledky pokusů s průmyslovými bramborý v letech 1953–1955. (**The results of testing industrial potatoes in the years 1953-1955**).
Za socialist. Zeměd. 1956 : **6** : 980–84.

Data on tuber and starch yields of a number of industrial varieties, grown in different districts of Moravia, are presented. Among the varieties, Capella, Ackersegen and Aquila were distinguished by good tuber yields and Parnassia, Kotnov and Capella by high starch contents, with Capella and Kotnov producing the most starch per given area. Kotnov and Capella showed a high degree of resistance to diseases, being in this respect only second to Aquila.

669 EREMENKO, A. L.
(**Description of the behaviour of some potato species at Novosibirsk**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1955 : No. 23 : 82–89. [Russian].

Among the cultivated forms of *Solanum chilotanum* tested at Novosibirsk, ff. *palmetta*, *pigmentatum*, *chilotanum* and *ovale* were distinguished by high yield and good tuber production and f. *sebolia* by resistance to drought. All these are regarded as good breeding material. Some cultivated forms of *S. andigenum* and *S. chilotanum* showed minor changes with regard to growth and tuber-forming habits in altered environments but the changes were less noticeable than in the wild species. Hardly any changes occurred in the cultivated forms *chalcoense* and *cuzcoense* of *S. andigenum* and ff. *palmetta* and *pigmentatum* of *S. chilotanum*. Most species and forms of *S. andigenum* were able to form tubers under the long-day conditions at Novosibirsk.

670 HOUGAS, R. W.
Foreign potatoes, their introduction and importance.
Amer. Potato J. 1956 : **33** : 190–98.

After describing the part played by certain introduced varieties and selections in early and modern potato breeding in the USA, the author gives an account of the Inter-Regional Potato Collection recently established at Sturgeon Bay, Wis.

671 CASSERES, E. H.
Progress in cooperative potato improvement work in Costa Rica.
Amer. Potato J. 1956 : **33** : 166–69.

The work of testing clones introduced from the USA is outlined (cf. *PBA*, XXVI, Abst. 2054). In 1954, 3VW–9 from Pennsylvania and HLT–6, HDY–8 and HIQ–1 from Cornell University showed particular promise with respect to late-blight resistance and yield. Their resistance depends upon R_1R_2; HLT–6 and HIQ–1 may also carry R_4. Plans are being made for the initiation of breeding.

672 VAN DER ZAAG, D. E.
Overwintering en epidemiologie van *Phytophthora infestans*, tevens enige nieuwe bestrijdingsmogelijkheden. (**Hibernation and epidemiology of *Ph. infestans* and some new possibilities of control**).
Tijdschr. PlZiekt. 1956 : **62** : 89–156.

The object of the experiments described was to detect the initial appearance of *Ph. infestans* in the field and to obtain information on the factors determining the rate of spread of the pathogen. It was shown that epidemics of late blight have as their focal point plants of a susceptible variety in which the pathogen has wintered and that the speed with which the epidemic spreads is closely correlated with the degree of susceptibility of neighbouring varieties. It is therefore suggested that, in breeding, the object should be to develop varieties, such as Voran [Onwards] and Noordeling, in which *Ph. infestans* does not usually winter and which are relatively resistant both in the tuber and the foliage.

673 HUDSON, P. S.
Who will win the potato races ?
Grower 1956 : **46** : 87–88.

In addition to briefly describing the value of the Commonwealth Potato Collection in breeding varieties resistant to diseases and pests, particularly late blight and eelworm, the author refers to potato breeding in the USSR, mentioning a talk with S. M. Bukasov who expressed the view that the problem of new races of late blight could probably be overcome by utilizing a wider range of wild species, from Argentina and elsewhere in S. America, instead of mostly Mexican species.

674 TAKASE, N. & TAKAKUWA, M.
(**Studies on the resistance of potatoes to late blight. II. On natural infection of interspecific hybrid potatoes by a new strain of late blight**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 1–4. [Japanese].

Observations on the reaction of a series of potato hybrids with *Solanum demissum* in their ancestry to natural and artificial infection by *Phytophthora infestans* in Hokkaido are reported. Some of the strains resistant to the common blight strain H_1 proved susceptible to a new strain H_2.

675 CASTRONOVO, A.
Producción de zoosporos binucleados por *Phytophthora infestans.* (**Production of binucleate zoospores of *Ph. infestans***).
Rev. argent. Agron. 1955 : **22** : 177–83.

The occurrence of binucleate zoospores in cultures of *Ph. infestans* is described and illustrated. From this it is concluded that the single-zoospore cultures with which tests for resistance have been carried out are not necessarily homogeneous and that changes occurring in their infective properties are not necessarily due to mutation.

676 AYERS, G. W.
The resistance of potato varieties to storage decay caused by *Fusarium sambucinum* f.6 and *Fusarium coeruleum.*
Amer. Potato J. 1956 : **33** : 249–54.

The degree of resistance of 25 named varieties and 21 unnamed seedlings has been determined in experiments carried out at Charlottetown during 1949–51. No variety was more susceptible than Sebago to *F. sambucinum* f.6, although Teton, Chippewa, Pontiac and Keswick are equally or only slightly less susceptible. Essex, Houma, Cherokee, Irish Cobbler, Pungo, Menominee, Warba, Cayuga and Merrimack show moderate to high resistance. Resistance to *F. coeruleum* is possessed by Essex, Merrimack, Ontario, Green Mountain, Snowflake, Cherokee, Early Gem, Kennebec and Menominee, while Keswick, Warba, White Cloud, Cayuga and Pontiac are highly susceptible.

677 CHARLES, A. W.
The parasitism of *Alternaria solani* (Ell. and Mart.) Jones and Grout on certain species of *Solanum*, and their use as sources of disease resistance.
Abstr. Diss. Univ. Camb. 1953–1954 (1956) : 4–5.

Among 68 species of *Solanum* tested for resistance to early blight, none was immune but clones of the wild diploid species *S. saltense* and *S. toralapanum* were highly resistant. The resistance of *S. saltense* could be partially broken down under certain conditions. In *S. saltense,* the pathogen entered by penetrating the cuticle or stomata and continued to spread intercellularly and intracellularly, apparently until limited by the formation of gums and tannins; in *S. toralapanum,* the fungus entered via the stomata only and penetrated for a short distance intercellularly. Crosses between the two species showed that resistance in each was recessive, inherited in a complex manner and determined by different genes. The two species are being used in breeding for resistance, tetraploids being produced by interspecific hybridization and by use of colchicine.

678 WAGGONER, P. E.
Variation in *Verticillium albo-atrum* from potato.
Plant Dis. Reptr. 1956 : **40** : 429–31.

Large differences in pathogenicity to the potatoes Kennebec and Saranac were observed within and between microsclerotial and non-microsclerotial types of the above fungus and within and between mass isolates. Changes, thought to be of genetic origin, in the relative pathogenicity of four single-spore isolates occurred in the course of a year. None of the isolates appeared to be specific for any of the three potatoes Kennebec, Saranac and Houma.

679 GEHRING, F. & BERCKS, R.
Untersuchungen über das Bukett- und Pseudo-Aucuba-Virus der Kartoffel. (**Investigations on the bouquet and pseudo-Aucuba viruses of the potato**).
Phytopath. Z. 1956 : **27** : 215–34.

This report of a general study, principally of the bouquet virus, includes tabular information on the comparative susceptibility of 20 German varieties to both the above viruses.

680 ROSS, H.
Probleme der Resistenzzüchtung gegen Viruskrankheiten in Pflanzen. (**Problems of breeding for resistance to virus diseases in plants**).
Arch. dtsch. LandwGes. 1956 : **17** : 95–108.

A brief survey is given of the position reached in Germany in breeding for resistance to virus diseases, especially in the case of potato and tobacco varieties. The mode of inheritance of the different types of resistance is explained in detail, special reference being made to the role played by wild species in building up resistant material.

681 AIL, Y.
Two new sweet potatoes for the West Coast.
Indian Fmg. 1956 : **6** : No. 5 : p. 23.

The American FB4004 (V8) and the Chinese TST White (V12) have given yields of 59–192% and 16–189% respectively over the local varieties, in ten-year trials at the Paddy Breeding Station, Mangalore.

682 **New varieties rapidly grown and propagated.**
Fmg. in S. Afr. 1956 : **32** : No. 4 : 6–8.

Several new varieties of sweet potato undergoing trials at the Horticultural Research Station, Pretoria, South Africa, are described. The high-yielding, pink-skinned variety 7–3 is particularly suited to clayey soils, where it produces long, slender tubers of uniform shape and size. The light creamy flesh is rich in vitamin A. An orange-coloured variety, 7–21, has a high content of vitamin A and C and produces good yields of tubers with an attractive shape and size. Highly productive even on poor soils, 4–95 produces largish tubers of an oval-round shape and with an attractive appearance. 6–27 also gives high yields of attractive tubers. The hybrid 4–95 x Gold Rush has shown exceptional promise on turf soils and 4–126 has done well on heavy soils.

683 ANDERSON, W. S.
Effect of storage on sweetpotatoes.
Miss. Fm. Res. 1956 : **19** : No. 5 : 3, 8.

Data are provided on changes in weight, dry matter and carotene content of Allgold, Goldrush and Porto Rico during curing and storage. The carotene content of Porto Rico increased by 10–15% of the original amount by the end of the storage period, while Allgold lost 17% and Goldrush 13%.

684 MOORE, E. L. & ANDERSON, W. S.
Sweetpotato harvest, curing and storage studies.
Miss. Fm. Res. 1956 : **19** : No. 6 : p. 2.

Australian Canner contains an average of 272 units of carotene after curing, Nancy Gold contains 191 and Porto Rico 146. In the case of Porto Rico the carotene content increases slightly during the curing period, whereas the other two varieties lose carotene.

685 FUJISE, K., YUNOUE, T. & CHISHIKI, T.
(**Studies on flowering and fruit setting in sweet potato varieties**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1955 : **3** : 109–42.

Observations on flowering, capsule set and number of seeds per capsule are recorded for a large collection of Japanese, Chinese and American varieties. Where flowering was difficult to obtain, it could often be induced by grafting on *Ipomoea bona-nox*, or, in the case of graft-incompatible varieties, by grafting on *I. bona-nox* with a graft-compatible variety as interstock. Short-day treatment was also of value for inducing flowering. Preliminary experiments indicated that grafting on *I. pes-caprae* is also promising for inducing flowering.

Marked differences in capsule set between the various combinations of the intrasterile cross-compatible groups A, B and C were not observed (cf. *PBA*, XIX, Abst. 2672).

686 MACNAIR, V.
Effects of storage and cooking on carotene and ascorbic acid content of some sweet potatoes grown in northwest Arkansas.
Bull. Ark. agric. Exp. Sta. 1956 : No. 574 : Pp. 19.

Two recently-introduced varieties, Golden Belle and Allgold, were compared in respect of yield, keeping qualities, response to various cultural treatments and carotene and ascorbic acid content at harvest, after storage and after preparation for eating. They were also compared with the widely grown Porto Rico Unit 1 and found to be generally superior.

FIBRES

687 STRAUMAL, B.
(**The principal methods in cotton breeding**).
Hlopkovodstvo (Cott.-raising) 1956 : No. 8 : 28–32. [Russian].

Breeding work on cottons in the USSR, together with the agrobiological techniques and breeding methods employed, is discussed. Hybridization involving material from different districts, interspecific crossing, sexual-vegetative hybridization, the use of pollen mixtures, with or without the pollen of another species such as *Hibiscus*, Mičurinist training and photoperiodic treatment, are all shown to have produced improved new varieties. Among these **147F**, **149F**, **150F**, **S4507**, **S4727**, **S8201**, **KK1543**, **S1622**, **S1581**, **S6002**, **5010B** and **S8017** deserve special mention as distinguished by greater earliness, increased yield and improved fibre quality compared with older varieties. Some new varieties, including S6002 and 5010B, produce fine fibre and show resistance to *Fusarium* and many others are resistant to *Verticillium*.

688 KARAGEZJAN, S.
(**Growing the cotton variety 108F under the conditions of Armenia**).
Hlopkovodstvo (Cott.-raising) 1956 : No. 7 : 37–39. [Russian].

In Armenia 108F outyields 1298 by 2–4 c. per ha. and surpasses it in ginning percentage, size of boll, length and strength of fibre but not earliness, the delay in maturation amounting to 8–13 days. Mention is made of greater earliness acquired by 108F within a few generations of its introduction in Armenia. This was however accompanied by minor reductions in the 1000 seed weight, boll size and strength of fibre. Breeding new varieties at the Armenian Institute of Tropical Plants is reported and in this connexion A354 and A16 are mentioned. They are large-bolled forms distinguished by earliness and high yield.

689 ALEKSANDROV, A.
(The achievements of Indian breeders in the Punjab).
Hlopkovodstvo (Cott.-raising) 1956 : No. 9 : 55–56. [Russian].

This account of breeding work on cottons mentions some new long-fibred varieties adapted to the climatic and soil conditions in the Punjab. Descriptions are given of 320F, 216F and H14, all notable for high yield and improved earliness, and data on ginning percentages and fibre length of ZZ53, ZZ54, ZZ55, ZZ56 and ZZ57 are presented. Most of these have longer fibre and a higher ginning outturn than 320F, but the growth periods of ZZ55, ZZ56 and ZZ57 are somewhat longer.

690 MARAPPAN, P. V. & NEELAKANTAN, L.
Note on the performance of perennial cottons at the Agricultural Research Station, Kovilpatti.
Madras agric. J. 1956 : **43** : 351–52.

The yield, halo length and ginning percentage of four varieties were compared during 1949–51, the variety Mocó giving the highest yield.

691 NEGI, L. S.
Cotton improvement work in the Punjab—a review.
Indian Cott. Gr. Rev. 1956 : **10** : 73–81.

An historical account of breeding work and the introduction of new types in the Punjab since the beginning of the present century is given; the eminent position of this territory as regards cotton growing is stated to be due mainly to the planting of improved strains of American origin. Since Partition the work carried out by the experimental stations in the Indian part of the Punjab has been intensified and emphasis is being placed on the development of superior strains of medium and long-stapled American cotton. Crosses are also being carried out between Punjab American strains and *Gossypium hirsutum* and *G. barbadense*. Descriptions are given of 216F, 320F and H14, the Punjab American cottons at present recommended for cultivation, and brief notes are provided on seven new long-linted strains recently developed at the Abohar station.

692 VENKOBA RAO, M., SESHADRI AYYANGAR, G. & JAGANNATHA RAO, C.
The problem of evolving a Cambodia type of cotton for the rainfed areas of the ceded districts.
Indian Cott. Gr. Rev. 1956 : **10** : 94–97.

Work at the Siruguppa Agricultural Research Station, Andhra State, on breeding and introducing varieties of *Gossypium hirsutum* suitable for the black soils of the ceded districts of Andhra State is outlined. The best results up to date have been obtained from Laxmi, MA2 and N14. Crosses have been carried out between lines 2196 and 1821, possessing resistance to black arm and jassids respectively, and high-yielding selections of Sudan 60, Laxmi, DA26, MA2 and BC134 x CW170 x Co2, all possessing superior fibre qualities. Some of these hybrids, which are still in the experimental stage, show considerable promise and it is hoped that selections from them all will provide the ceded districts with high-yielding varieties that produce cotton of good quality and are at the same time resistant to diseases, insect pests and adverse weather conditions.

693 RYŽOV, S.
(The tasks for the USSR Cotton Institute during the sixth five-year plan).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. 6 : 18–19. [Russian].

Mention is made of new varieties from the Cotton Institute. They have a habit suitable for combine harvesting and are characterized by greater earliness than 108F and improved resistance to diseases. KK1543 from Kara Kalpak and 147F from Fergana will supersede 108F in the mountainous districts and S1581, 150F and S4727 in the principal cotton-growing areas.

694 DICK, J. B. & LUND, Z. F.
1950-54 cotton variety test. Yazoo-Mississippi Delta.
Bull. Miss. agric. Exp. Sta. 1955 : No. 526 : Pp. 11.

The results of variety trials carried out in the Delta during the above five-year period are summarized and discussed.

695 O'KELLY, J. F., CROCKETT, S. P., HURT, B. C., MURPHY, B. C. & COATS, R. E.
Mississippi cotton variety tests 1955. Cotton variety tests in hill sections.
Circ. Miss. agric. Exp. Sta. 1956 : No. 202 : Pp. 12.

The results of tests carried out on varieties during 1955 in the hill districts and Delta are tabulated.

696 O'KELLY, J. F. *ET AL.*
Cotton for the hill sections.
Miss. Fm. Res. 1956 : **19** : No. 1 : 2–3.

Results are given of six sets of trials comprising 16 varieties and these are compared with the results for the four preceding years. Data are given of pounds of lint per acre, lint percentage, staple length, and number of bolls corresponding to one pound of lint.

697 DICK, J. B. & RAMEY, H. H.
Cotton for Delta.
Miss. Fm. Res. 1956 : **19** : No. 1 : p. 3.

Results are given of trials of eleven commonly grown varieties at four localities. Data are given of yield per acre, ginning outturn, staple length and micronaire index.

698 **New cotton variety.**
What's New Crops Soils 1956 : **8** : No. 8 : p. 33.

Pope, an early, prolific variety developed by the Tennessee Agricultural Experiment Station and the US Department of Agriculture, has given an average of 20% more lint per acre than the best commercial varieties available in tests conducted over three years. It bears medium to small bolls and has a lint content of 38–41%. The fibre is 1–1$\frac{1}{16}$" long under good conditions and is of medium fineness, good strength and high spinning quality.

699 MOORE, J. H.
Cotton breeding in the Old South.
Agric. Hist. 1956 : **30** : 95–104.

An historical account of cotton breeding in the southern states of the USA during the first half of the nineteenth century is presented, mention being made of the spread of such varieties as Mexican Hybrid, Petit Gulf, 100 Seed and Banana and of the work of the cotton breeders Burling, Nutt and Vick.

700 GLAVINIĆ, R.
Hybrides du cotonnier, obtenus de plusieurs pères. (**Cotton hybrids obtained by multiparental pollination**).
Bull. Sci. Cons. Acad. Jugosl. 1956 : **2** : p. 122. (Abst.).

At Belgrade University, mixed pollination of *Gossypium barbadense* 'Maarad' with pollen of *G. hirsutum* and *G. herbaceum* gave rise to F_1 and F_2 progenies that included plants combining the morphological characters of both pollinators.

701 SELF, F. W.
Stardel: A new cotton variety.
Bull. La. agric. Exp. Sta. 1956 : No. 503 : Pp. 8.

Stardel (Stoneville 2B–462 x Deltapine 14) has yielded 7% more lint than Deltapine 15 and other leading varieties grown in Louisiana. It has a high lint percentage, high fibre strength, satisfactory boll size, medium staple length and good picking qualities.

702 GLAVINIČ [GLAVINIĆ], R.
(**How the new cotton variety "Makedonka" was developed in Jugoslavia**).
Hlopkovodstvo (Cott.-raising) 1956 : No. 8 : 52–56. [Russian].

At Skopje, the growth period of *Gossypium hirsutum* 'Big Boll', originating from the USA, was shortened by subjecting the plants at the end of vernalization to low temperatures. The new variety Makedonka [Macedonian], thus obtained, is as early as the standard 182 in the Kavadar, Valandov and Gevgelija districts, but produces 2·5 mm. longer fibre, has 7% higher ginning outturn and yields 588 kg. more cotton per ha.

703 MÉNDEZ R., E. D.
Comportamiento de las selecciones de algodón Tangüis La Molina en sembríos semi-industriales. Campaña 1954–55. (**Behaviour of the La Molina Tangüis cotton selections in semi-industrial sowings. Season 1954-55**).
Inf. mens. Estac. exp. agríc. La Molina 1956 : **30** : No. 344 : 1–8. (Mimeographed).

Improved yields are reported for the early-maturing selection LM1041–49 in a number of areas in 1954–55, in spite of very unfavourable weather conditions. In areas affected by *Verticillium* wilt, selections LM.WI–52 and LM.WII–52 have behaved well.

704 MÉNDEZ R., E. D.
Creación de variedades precoces de algodón, campaña 1954–55. (**Creation of early varieties of cotton, season 1954-55**).
Inf. mens. Estac. exp. agríc. La Molina 1956 : **30** : No. 343 : 10–15. (Mimeographed).

The Tangüis x Pima selection 888–50 produced 75% of its crop by 6½ months from sowing, as compared with only 51% in the control line of Tangüis, which the hybrid outyielded by 24% in 1954, a year in which weather conditions were unusually unfavourable. Several other hybrid selections exceeded the Tangüis control significantly in yield and the commercial classification of the lint from hybrids 888–53 and 900–53 was equal to that of Tangüis.

705 Simpson, D. M. & Duncan, E. N.
Cotton pollen dispersal by insects.
Agron. J. 1956 : **48** : 305–08.

Natural crossing, effected largely by bumble bees, averaged 47% at all sampling points in an experimental field at Knoxville, Tenn., indicating that the field was completely and uniformly covered by the insects. The amount of crossing was influenced by variety and by the distance from foreign pollen, cross pollination between adjacent plantings of two varieties being reduced from 26% to 4% by a 25 ft. barrier of cotton. On the basis of these results, a system of planting and harvesting for the production of hybrid combinations without the use of special isolation fields is suggested.

706 Pollard, D. G. & Saunders, J. H.
Relations of some cotton pests to jassid resistant Sakel.
Emp. Cott. Gr. Rev. 1956 : **33** : 197–202.

A study was made of the incidence of cotton pests on the two Sakel strains BLR14/25 and BLJR14/36, the former bearing the genes h_1h_1 for glabrous leaves and the latter carrying H_1H_1 resulting in the presence of hairs on the lower surface of the lamina. While jassid (*Empoasca libyca*) was discouraged by the presence of hairs, *Bemisia tabaci* and *Aphis gossypii* showed a significant increase and *Tetranychus* sp. a non-significant increase on hairy plants. Observations on *Platyedra gossypiella, Earias insulana, Hercothrips furnipennis* and *H. sudanensis* were inconclusive. *Podagrica pallida* and *P. puncticollis* showed a marked preference for the glabrous upper leaf surface in the hairy strain. In view of these results, breeding for jassid resistance by means of added hairiness should be undertaken with caution; it is suggested that it may be possible to obtain a suitable combination of length, density and distribution of hair to control jassid without appreciably increasing the incidence of other pests.

707 Stroman, G. N.
A new hand cotton fiber sorter for use in breeding for fiber regularity.
Agron. J. 1956 : **48** : 320–21.

A simple apparatus for sorting cotton fibres according to length is described; it is used in determining the percentages by weight of the different lengths in each sample.

708 Nanjundayya, C.
Technological reports on trade varieties of Indian cottons, 1955.
Technol. Bull. Indian Cott. Comm. : Ser. A : 1956 : No. 89 : Pp. 87.

The results of fibre, yarn and spinning tests on samples of 33 varieties during the season 1954–55 are given, and compared in most cases with the results for the preceding four seasons.

709 Thurman, R. L. & Henderson, M. T.
The inheritance of lint density index in American Upland cotton.
Agron. J. 1956 : **48** : 344–47.

Data from F_2 plants of Empire x AHA6–1–4 revealed an extremely close positive association between the lint-density index (weight of lint per unit area of surface) and number of fibres per unit area. In Half and Half x AHA6–1–4, DPL14 x AHA6–1–4 and the above-mentioned cross, all representing combinations of high x low lint density, lint-density index was quantitatively inherited, dominance being absent in the F_1 and F_2. In the first two crosses, respective heritability estimates of 35% and 43% for lint density index were obtained from regression of F_3 means on F_2 plant values. Selection for a high degree of density among single plants was highly effective. Lint-density index was not correlated with seed size in any of the crosses. In the F_3 of Half and Half x AHA6–1–4, density was negatively associated with strength.

710 Stith, L. S.
Heritability and interrelationship of some quantitative characters in a cross between two varieties of *Gossypium hirsutum*.
Iowa St. Coll. J. Sci. 1956 : **30** : 439–40. (Abst.).

In a cross between the commercial Upland cotton Acala and the wild variety Hopi, lint percentage, boll size, staple length, fibre strength and fibre fineness were all quantitatively inherited, high lint percentage, large boll size and long fibres being partially dominant. Boll size and staple length appeared to be controlled by a large number of genes and the other characters by a small number. Heritability values estimated from the genotypic variance of the F_2 population and from the variance components among F_3 lines were, respectively: for lint percentage, 45·3 and 79·0%; for boll size, 50·1 and 62·5%; for staple length, 22·2 and 70·0%; for fibre strength, 54·1 and 87·3%; for fibre fineness, 74·6 and 69·9%. On the basis of phenotypic and genotypic correlations in the F_2 and F_3 it is concluded that lint percentage is unfavourably associated with other fibre properties and that selection for large boll size would result in longer, stronger and finer fibres but low lint percentage. Where fibre fineness is the chief breeding aim, early selection on a single-plant basis followed by selection for staple length and fibre strength should be effective.

711 Murthy, K. S. & Rao, P. N.
Improvement of ginning in Westerns cotton.
Andhra agric. J. 1956 : **3** : 141–44.

Selections were made from the progeny of crosses between various strains of *Gossypium herbaceum* for improved ginning percentage. Increases up to 42% over unselected Westerns were obtained without increase in fibre weight or decrease in fibre length and yield. This increase has been maintained for five years by the hybrid selection 3791–6–6–1 compared with an average of 29% shown by one of the parents, Westerns–1.

712 Fryxell, P. A.
A genetic analysis of yield in Upland cotton (*Gossypium hirsutum* L.).
Iowa St. Coll. J. Sci. 1956 : **30** : p. 361. (Abst.).

The varieties Hartsville and Acala and an F_2 population derived from a cross between them were used in a study of selection for yield. Data were collected on 13 variables obtained by subdividing yield into component traits in two alternative ways and the various traits were then used to construct 14 selection indexes. The indexes tended to be more efficient criteria of selection than yield itself, having a mean efficiency of 250% compared with direct selection for yield. No detectable difference was found between indexes derived from the two alternative systems of subdivision. The heritabilities of the component traits generally showed a progressive increase with successive levels of subdivision, in agreement with the assumption that yield is controlled by additive genes.

713 Knight, R. L.
The genetical approach to disease resistance in plants.
Emp. Cott. Gr. Rev. 1956 : **33** : 191–96.

The substance of this article has been summarized in *PBA*, XXVI, Abst. 1090.

714 Simpson, D. M.
Strains of cotton resistant to bacterial blight.
Plant Dis. Reptr. 1956 : **40** : 549–55.

A table lists varieties and selections available in the USA as sources of resistance to bacterial blight (*Xanthomonas malvacearum*), information being given on the stations maintaining the stocks, parentages, reaction to races, genes for resistance, and technological and agronomic characters.

715 Borisov, G.
(Results of testing new cotton varieties).
Hlopkovodstvo (Cott.-Raising) 1956 : No. 8 : 33–38. [Russian].

Descriptions are given of new Soviet varieties, in particular KK1543 from Kara Kalpak and 147–F from the Fergana Research station of the Cotton Institute and 2421 and 2173 from the Azerbaĭdžan Cotton Institute. All these are distinguished by earliness and resistance to *Xanthomonas malvacearum* and *Verticillium* wilt. Worth mentioning also are the new midseason variety KR2, bred at an Uzbek state farm, and the fine-fibred variety 8763I from Iolotanj, Turkmenia; KR2 has similar properties to 108F but is more moderate in its moisture requirements, has a habit suitable for combine harvesting and has a 1% higher ginning outturn. The new fine-fibred variety is characterized by greater earliness and improved resistance to *X. malvacearum* compared with the standard 5476I which it also surpasses in raw-cotton yield before the onset of frost.

716 Tolba, M. K. & Moubasher, A. H.
Effect of age of cotton seedlings on their susceptibility to *Rhizoctonia* damping-off.
Nature, Lond. 1956 : **178** : 498–99.

Experiments on the varieties Ashmouni and Giza 30 showed that susceptibility to *Rhizoctonia solani* decreased with age, the seedlings becoming completely resistant after a certain period which varied according to the temperature during germination and emergence. Seedlings of Giza 30 tended to remain susceptible for somewhat longer periods than those of Ashmouni, especially when grown at the lowest temperature (9–10° C).

717 Saunders, J. H.
Bagging cotton flowers for breeding—II. Endrin treatment of paper bags.
Emp. Cott. Gr. Rev. 1956 : **33** : 226–30.

The use of bags impregnated with the insecticide Endrin proved superior to the use of untreated bags and to gumming the tip of corolla as a means of producing viable seed on selfing. The improvement in seed production is ascribed to the control over bollworms and *Oxycarenus hyalinipennis* afforded by the treated bags.

718 Danell, N.
Sortförsök med spånadslin åren 1951–1955. **(Varietal trials of fibre flax in the years 1951-1955).**
Medd. Jordbruksförs. 1956 : No. 69 : 83–112.

Five Swedish flaxes, eight Netherlands varieties and one from Northern Ireland were included in trials conducted during the above period at stations throughout Sweden. The Netherlands variety Wiera gave the highest average yield, its superiority in both fibre and seed production being most marked in Skåne.

719 Joshi, A. B. & Hardas, M. W.
A chromosome number new to *Linum*.
Nature, Lond. 1956 : **178** : p. 499.

L. mysorense from India has a chromosome number of $2n = 60$, with regular formation of bivalents.

720 Manninger, I.
Adatok a len keresztezéséhez és oltásához. **(Data on crossing and grafting flax).**
Martonvásár. növényterm. Kutató Int. Évkön. 1950 (1952) : **1** : 45–66.

In crossing experiments it was found that more seeds were set (*a*) on the first-formed than on later-formed flowers of the inflorescence and (*b*) on flowers emasculated in the evening and pollinated the following morning than on flowers emasculated and pollinated on the same morning. Cool days with a mean temperature of 18–20° C. had a favourable influence on fertilization. Interspecific crosses have so far proved unsuccessful.

721 Holden, D. J.
Factors in dehiscence of the flax fruit.
Bot. Gaz. 1956 : **117** : 294–309.

Using the indehiscent variety Punjab 47, the semidehiscent Marine and completely dehiscent Coimbricum, investigations were carried out on anatomical features, the chemical composition and structure of the cell walls in the areas of dehiscence and the imbibitional properties of these cell walls. The effects of ecological conditions and spraying with growth substances were also studied.

The results included the observation that the varieties show a major difference in the anatomical changes in the third layer of cells of the pericarp after fertilization, the greatest degree of dehiscence being associated with a radial elongation and the least with a tangential elongation of these cells. In the semidehiscent variety the cells are intermediate in direction of elongation. It was also found that the degree of dehiscence in a variety may differ according to the ecological conditions.

722 Schwinghamer, E. A.
Physiologic specialization in *Colletotrichum linicolum*.
Phytopathology 1956 : **46** : 300–05.

This is a fuller account of work described in *PBA*, XXV, Abst. 2223.

723 Bócsa, I. & Beke, F.
Néhány külföldi kenderfajta hazai termesztési és nemesítési értéke. **(The value of some foreign hemp varieties for home production and breeding).**
Növénytermelés 1956 : **5** : 39–50.

Four Turkish, two Chinese, two French, one Lebanon, three Soviet, one Italian and two East-German varieties were tested in Hungary over a period of three years. The Turkish varieties were of the type designated Mediterranean or of the closely similar Asia Minor type and gave stalk yields equal to those of Hungarian varieties but lower fibre yields. The Chinese varieties were distinguished by the high tensile strength of their fibre and their resistance to *Psylliodes attenuata*. One of the Soviet varieties, of South Caucasian origin, equalled Hungarian varieties in yield. The other varieties studied were unsuited to Hungarian conditions. In heterosis experiments, hybrids between the Turkish variety Fatsa and Hungarian varieties showed promise but matured too late to produce much seed. Other hybrids were intermediate in yield between the parents.

724 **Annual Report of the Tanganyika Sisal Growers' Association, Sisal Research Station, Mlingano, Ngomeni, for the year 1955** : Pp. 21.

The report includes a brief account of breeding. Although higher in leaf production, few of the hybrids tested have substantially outyielded *Agave sisalana*. The size, length and shape of the leaves, as well as number, are evidently important in determining fibre yield. An F_2 hybrid (11648) of *A. amaniensis* x *A. angustifolia* shows particular promise; the fibre is easy to decorticate although finer than sisal. Cross pollination between *A. angustifolia* x *A. amaniensis* plants producing high numbers of leaves is in progress.

725 Shinohara, S., Takehi, T., Kawamura, M. & Sano, M.
(Studies on breeding varieties of *Luffa* resistant to *Fusarium* wilt. III. On breeding by hybridization).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 56–64. [Japanese].

Further to the work summarized in *PBA*, XXVI, Abst. 3543, the authors have made a series of intervarietal crosses in order to obtain *Fusarium*-resistant material. Resistant segregates were obtained from Daruma x Beikan [Rice Tube], (Tokado [Ten-sided] x Daruma) x Tsurukubi [Crane's Neck] and (Tokado x Duruma) x Beikan. Resistance appears to be determined by multiple genes.

SUGAR AND STARCH PLANTS

726 Loh [Lo], C.-S. & Tseng, P.-M.
(Studies on P.T. 50-62 and some other new varieties of sugar cane).
Kanche Yenchiu/J. Sugar Cane Res. 1954 : **8** : 21–58. [Chinese].

Five new Pingtung varieties are described, all save the last hard-stemmed varieties adapted to typhoon conditions. PT 50–62 (a seedling of PT 43–52) has stems of grade 1 hardness and has a high sugar yield; PT 50–2 (a sister cane of the previous variety) is notable for its profuse and even tillering; PT 49–729 (PT 41–1114 x PT 47–521) is a late variety with stems of grade 1 hardness; PT 51–11 (PT 46–150 x PT 43–52) is another variety with profuse and even tillering; while PT 48–40 (POJ 3016 x F134) is able to grow rapidly at high temperatures.

727 **(Report on comparative trials of sugarcane varieties in 1952-53).**
Kanche Yenchiu /J. Sugar Cane Res. 1953 : **7** : 187–243. [Chinese].

This report follows along the same lines as that for the previous season (cf. *PBA*, XXIV, Absts. 2287–8). The following new Pingtung varieties are singled out for special mention: PT 47–50, 48–4, 48–29, 48–70, 48–80, 48–468, 48–630, 48–655, 49–73, 49–729 and 49–839.

728 Loh, C.-S.
(A survey of sugar-cane breeding in Taiwan. The raising of the PT varieties).
Chunghua Nunghsueh Hui Pao/J. agric. Ass. China 1956 : New Ser. No. 13 : 19–27. [Chinese].

The sugar-cane breeding programme at Pingtung, Taiwan, from 1946 onwards, is reviewed. The main breeding objectives have been sugar production, hard stems, reduced tasseling and disease resistance. The principal parents have been (1) POJ 2725 and 2878, (2) Kassoer derivatives for mosaic resistance, and (3) Badila seedlings for downy-mildew resistance. Among the hard-stemmed canes produced at Pingtung are PT 50–2, 50–62 and 51–11.

729 **Recent progress of sugarcane breeding in Taiwan.**
Taiwan Sug. 1956 : **3** : No. **7** : 20–22.

A short general review of sugar-cane breeding in Taiwan is presented. The following new varieties have been recently released: 34–1428 (POJ2725 x PSA32), a variety with a sugar yield per ha. 25% greater than POJ2883; H32–8560 (Co.213 x POJ2878), an introduction from Hawaii highly resistant to downy mildew; H37–1933 (H32–8560 x H34–1814), an introduction of value for interplanting with rice; and 36–1119 (F86 x 1130/16A), a late cane resistant to mosaic, leaf scorch and downy mildew.

730 **Eleventh Annual Report of the Indian Central Sugarcane Committee 1954-1955** (1956) : Pp. 128.

Further crosses were effected, including those between the introduced sugar canes M165/38, F31–436, Q28, Q50, H37–1933 and Pindar on the one hand and Co. canes on the other.

By repeated back crossing of *S. officinarum* x *S. spontaneum* to *S. officinarum*, derivatives in which the number of *S. spontaneum* chromosomes has been reduced to 8 have been secured. The formation of 5_{III} suggests that 5 of these chromosomes have paired with 5_{II} of *S. officinarum*; the other 3 remain as univalents. By back crossing to *S. spontaneum* instead, the number of *S. officinarum* chromosomes has been gradually reduced to 10 in the haploid complement of the third back cross.

Collection of *S. spontaneum* was completed by visits to the states of Madhya Bharat, Bhopal, Hyderabad and Bombay. Some forms of this species have shown immunity from smut (*Ustilago scitaminea*).

Varietal tests of resistance to smut and red rot (*Colletotrichum falcatum*) continued at Coimbatore, the Indian Agricultural Research Institute at New Delhi and other stations.

The results of field and milling trials of Co. canes in the different states are also reported.

731 Weitzman, L. & Gutstein, I.
(Testing sugar-cane varieties).
Sadeh (Field)/Hassadeh 1956 : **36** : 629–31. [Hebrew].

Introduced varieties of sugar cane have been compared with the local variety in a field trial laid down in 1954. The highest yields were from Co.419, EPC33–201 and the local variety, with 114, 108 and 76 tons of cane per ha. respectively. The highest sucrose content was found in CP44–101 (15·3%) and the local variety (14·9%). The local variety is the earliest in maturity, but is the most liable to lodge.

732 **Cane variety N : Co.334 is to be distributed.**
S. Afr. Sug. J. 1956 : **40** : p. 543.

N : Co.334, intended as a replacement for Co.301 on sandy soils, is now to be released by the Experimental Station of the South African Sugar Association (cf. *PBA*, XXIII, Abst. 2097). N : Co.334 has given good yields in variety trials on sandy soils and is moderately resistant to smut, mosaic and lodging. It is, however, highly susceptible to ratoon stunting disease.

733 **Twenty-first Annual Report of the British West Indies Central Sugar Cane Breeding Station, Barbados for the year ending September 30th, 1954** : Pp. 53.

The results of seedling trials are reported in detail. Further crosses involving complex interspecific parentages were effected.

Progress was made in inbreeding Barbados varieties, juice quality being well maintained in most selfed lines (cf. *PBA*, XXVI, Abst. 544). Nonarrowing or only sparsely arrowing lines are being developed from B41211 and B41227, both of which arrow heavily in Barbados. Such lines, otherwise similar to the original varieties, may possibly be useful in breeding or as commercial canes. A self-trashing line has segregated from B35276.

A new and less expensive type of "breeding lantern", consisting of a light framework and plastic covering, has proved satisfactory. A solution of Aretan was effective for the preservation of male arrows placed in the lantern, normal pollen shedding being ensured for 3–4 days.

The following $2n$ chromosome numbers are reported: *Saccharum spontaneum* 'Tukuya', 124; *Erianthus arundinaceus*, 60; CP36–116 (La. Purple x noble cane) and Ajax (Badila x noble cane), 80; POJ2878 (POJ2364 x EK28), 121; CI41–223 (sib cross F31–436 x F31–452), 99; H32–1063 (POJ2878 x 28–4399), 114; M134/32 (POJ2878 x D109), 97; and PR1000 (POJ2878 x Co. 281), 119. Selfed derivatives from interspecific-hybrid varieties frequently have a few chromosomes less than the original variety, probably on account of loss of univalents; meiotic irregularity may in other cases result in increase in chromosome number. The inbreds show a general tendency towards stabilization of $2n = ca.$ 110–112.

In *Saccharum*, from the earliest stages of prophase, the chromosomes are evenly arranged immediately inside the nuclear membrane.

Further evidence of the auxiliary value of stem-epidermis patterns in varietal identification was obtained from material including noble canes, *S. spontaneum*, *S. barberi*, *S. sinense* and *S. robustum* and hybrids ranging from single nobilizations to trispecific combinations. The criteria of differentiation of the patterns into several groups lie mainly in the characteristics of the silica and cork cells.

734 **Summary of important sugarcane varietal information as based on tests conducted in Louisiana during recent years.**
Sug. Bull. N. Orleans 1956 : **34** : 304–05.

Tabulated data giving the results of tests carried out in different parts of Louisiana during the period 1951–55 are presented. The information provided includes particulars of average yield, stem diameter, millability, disease resistance, susceptibility to borers and suitability for cultivation on heavy soils.

735 **Sugarcane gets a break.**
Agric. Res., Wash. 1956 : **5** : No. 2 : 10–11.

Resistance or immunity to ratoon stunting disease has been found in CPI, a USDA hybrid, B39246 from Barbados, Ba.11569 from Puerto Rico and Cl.4170, a hybrid produced by the US Sugar Corporation. They are being used in a breeding programme at Canal Point, Florida, simultaneous flowering being brought about by applying the appropriate photoperiods and temperature treatments to each strain.

736 NISHIYAMA, I.
Basic numbers in the polyploidy of *Saccharum*.
J. Hered. 1956 : **47** : 91–99.

From a study of meiotic chromosome pairing at metaphase I in pollen mother cells of three clones and nine interspecific hybrids involving *S. officinarum*, *S. robustum* and *S. spontaneum*, it is concluded that the basic chromosome numbers in the genus are 8 and 10 and that polyploid numbers are multiples or combinations of these. In crosses between *S. officinarum* ($2n = 40$) ♀ and *S. spontaneum* ($2n = 32$) ♂ the number of chromosomes from the ♀ parent was generally doubled in the hybrid and some hybrids from other crosses had supernumerary chromosomes giving an aneuploid number.

737 LOH [LO], C.-S. & TSENG, P.-M.
(**Studies on the growth characteristics of three new sugar cane varieties**).
Chunghua Nunghsueh Hui Pao/J. agric. Ass. China 1955 : New Ser. No. 11 : 46–83. [Chinese].

Further to the report summarized in Abst. 726 details are given on the germination, growth, tillering and yielding capacity of the varieties PT 50–62, 50–2 and 51–11.

738 GUILBEAU, W. F. & STEWART, C. W.
Resume of milling and processing characteristics of three new sugarcane varieties.
Sug. Bull., N. Orleans 1956 : **34** : 276–77.

A summary is given of the results of tests carried out for four years on the milling and processing characteristics of N : Co.310, CP48–103 and CP47–193, with CP44–101 as standard (cf. *PBA*, XXVI, Absts. 541–2).

739 BREAUX, R. D., DUNCKELMAN, P. H. & CHILTON, S. J. P.
Effectiveness of selection for Brix among individual stools of first stubble seedlings.
Sug. Bull., N. Orleans 1956 : **34** : 288–93.

In a study of three series of crosses at the Louisiana State Agricultural Experiment Station, the correlations obtained between the Brix value of individual first-stubble stools and sucrose content of the plant canes indicated that selection for Brix in the initial stools is partly effective as a means of obtaining varieties high in sucrose content. The results suggested that the standard of selection for Brix could be raised to 100% of the controls without the likelihood of eliminating canes with high sucrose content.

740 DUTT, N. L.
World collection of sugar canes established at Coimbatore.
Int. Sug. J. 1956 : **58** : 153–55.

This article describes the establishment of a new world collection of sugar canes at the Sugar Cane Breeding Institute, Coimbatore, India. The objectives proposed include the collection and maintenance of clones of special interest from all the principal sugar-growing countries and the compilation of a catalogue of genetic stocks.

741 HIRSCHHORN, E.
Acortamiento del ciclo evolutivo del carbón de la caña de azúcar. (**Shortening the developmental cycle of sugarcane smut**).
Idia 1956 : No. 100 : 12–14.

A considerable shortening of the developmental cycle of *Ustilago scitaminea* results from inoculating immature instead of mature shoots. A table showing the length of the developmental cycle of the smut after inoculation into both immature and mature shoots of a series of varieties grown in Argentina is given.

742 VASUDEVA, R. S.
News from India. Sugar-cane rust (***Puccinia kuehnii***).
Commonw. Phytopath. News 1956 : **2** : p. 44.

Data are reported on varietal susceptibility to the above pathogen in southern India.

743 LO, T. T.
The program of controlling ratoon stunting disease of sugar cane in Taiwan.
Taiwan Sug. 1956 : **3** : No. **7** : 18–19.

This article includes data on the susceptibility of the major varieties grown in Taiwan to ratoon stunting and on the ability of the varieties to withstand hot-water treatment.

744 ZABALA, S.
El mosaico de la caña de azúcar. (**Sugar-cane mosaic**).
Idia 1956 : No. 99 : 13–20.

Argentine tests have shown the following varieties to be immune from mosaic: Villa Alberdi 571, 3593, 3796, 4942, 5474, 6023, 6130, 6142, 6146, 6159, 6160, 6168, 6262, 6267, 6269, 6466 and 8216, Tucumana 26245, 2680 and 3342, Campo Brasil 33–61, 38–22, 38–39, 41–76, 46–16, 46–16, 46–47 and 47–15, CP29–116, POJ 2725, 2727, 2878, 2946, 2947 and 2961, and Co. 339 and 421.

745 **New syrup sorgo.**
Agric. Res., Wash. 1956 : **5** : No. 2 : p. 11.

A new sorghum variety for the production of syrup has been named Wiley. It is one of the offspring of the cross (Collier x MN 822) x MN 2046, and in three-year comparative trials with Tracy and Sart it outyielded both in weight of stalks and quantity of syrup. It matures six to ten days earlier than Sart and is adapted to a wide range of environmental conditions. It is resistant to *Physalospora tucumanensis* and *Colletotrichum graminicola*.

746 Kargl, R.
Výsledky srovnávacích sortovních pokusů s cukrovými semeny v letech 1951–1954. (**Results of comparative varietal trials with sugar-beet seeds in the year 1951-1954**).
Listy cukr. 1955 : **71** : 160–65.

Field experiments with Czech varieties in the above period are reported.

747 Kargl, R.
Srovnávací sortovní pokusy s čs. cukrovými semeny v roce 1955. (**Comparative varietal trials with sugar-beet seeds in the year 1955**).
Listy cukr. 1956 : **72** : Suppl. No. 1.

The results of varietal trials in 1955 are evaluated in comparison with the results for earlier years. The year 1955 was wet; Dobrovická C did best under these conditions. The best varieties for refined sugar yield and with the lowest MB factors (cf. Abst. 751) are Dobrovická A, C and N and Zapotilova C.

748 Orlovskiĭ, M. I.
(**Breeding as an important method for improving productiveness and sugar content in beets**).
Visnik Akad. Nauk Ukr. RSR (Rec. Acad. Sci. Ukr. SSR) 1956 : No. 1 : 11–22. [Ukrainian].

This survey of breeding work on sugar beets in the USSR mentions new varieties bred at Ramonj, Verhnjačka, Uladovo and Ivanovka. These surpass the previous standards in the Čerkassk, Žitomir, Harjkov, Vinnica and Voronež provinces in root and sugar yields.

749 Fiedler, J.
Příspěvek ke studiu možností vegetativní hybridisace u cukrovky a krmné řepy. (**A contribution to the study of the possibility of vegetative hybridization with sugar beet and mangels**).
Listy cukr. 1956 : **72** : 195–98.

Slight changes due to vegetative hybridization are reported but not such that vegetative hybridization could be regarded as equivalent to sexual hybridization.

750 Donà dalle Rose, A.
Ulteriori considerazioni sulla coltura autunno-vernina della bietola e sui criteri di miglioramento dei tipi adatti al mezzogiorno. (**Further considerations on the autumn-winter cultivation of beet and on the criteria for breeding types suitable for the south**).
Agricoltura d. Venezie 1956 : **10** : 289–303.

The various factors which combine to cause bolting when sugar beet is sown as a winter crop in parts of southern Italy are analysed. The first selections resistant to bolting were inferior to the common varieties in sugar yield and the author is now attempting to improve them by the induction of polyploidy and by selection under controlled conditions of illumination and temperature, the technique of which is described.

751 Drachovská, M. & Šandera, K.
MB-faktor k rozlišování cukrovek, polocukrovek a krmných řep. (**The MB factor for discrimination of sugar beets, half sugar beets and mangels**).
Listy cukr. 1955 : **71** : p. 209.

The method recommended is to calculate the MB factor, the number of parts of molasses to one hundred parts of produced white sugar. Tables of MB factors for sugar beets and mangels are included.

752 Graf, A.
Combined variety-tests in cases of Cercospora-infestation. A contribution to the question of variety-selection in Austria.
Bundesanst. PflBau. Samenprüf., Wien Pp. 8; also in German and French.

US215 x 216/3 and Beta Y19 proved highly resistant to *C. beticola* in field trials conducted by the Federal Institute for Plant Cultivation and Seed Testing, Vienna, Austria, but their root and sugar yields were markedly inferior to those of susceptible varieties such as Kleinwanzleben Polybeta, Beta 242/53 and Kleinwanzleben E even when the plants were not sprayed with fungicides. Spraying led to a pronounced increase in the yields of the susceptible varieties whereas the yields of the resistant varieties were almost unaffected.

753 Watson, M. A. & Russell, G. E.
The value of glasshouse tests with seedlings in selecting plants tolerant to beet yellows virus.
Ann. appl. Biol. 1956 : **44** : 381–89.

The reactions of commercial strains and breeding lines of sugar beet and of breeding lines of *Beta vulgaris* ssp. *maritima* to infection with the SBY or the SBYN isolate of the yellows virus were studied in the greenhouse, by means of the vector *Myzus persicae*; two of the cultivated and two of the wild beets were subsequently tested in the field. All the material was susceptible, but variation in severity of the symptoms was observed between different lines. Scores for degree of infection in the greenhouse were positively correlated with field scores, the extrapolation from greenhouse to field results appearing to be more reliable for the cultivated than for the wild beet types. Reduction in yield was positively correlated with severity of symptoms.

754 ARUN KUMAR SHARMA & DE, D. N.
Polyploidy in *Dioscorea.*
Genetica 1956 : **28** : 112–20.

According to investigations at the Botany Department, Calcutta University, *D. sativa* has $2n = 40$ and *D. alata* $2n = 30$, 40, 50 and 70 chromosomes. In *D. alata* the number of satellites ranged from two to six but in *D. sativa* it was invariably two. Variations in chromosome number were found within some individual plants of *D. alata*, cells with $2n = 38$, 52, 56 and 66 being observed. Meiosis could only be investigated in *D. sativa*, in which 20 bivalents were seen at diakinesis. Polyploidy and intraplant variation in chromosome number are discussed with reference to their possible role in the evolution of the genus.

755 KUMAZAWA, S., NIIUCHI, K. & HONDA, F.
(**Classification of Japanese taro varieties**).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1956 : **25** : 1–10.

A collection of 205 Far Eastern varieties is classified into 15 varietal groups. Morphological descriptions of typical representatives of these groups are given, special attention being paid to tuber shape. The nomenclature of the taro in Japan during the past two hundred years is reviewed.

756 RATTENBURY, J. A.
Cytotaxonomy and the migration of primitive peoples.
Nature, Lond. 1956 : **178** : 545–46.

The chromosome numbers of varieties of food plants are being determined in a project of the Botany Department, Auckland University College, NZ, to elucidate the migrations of the Polynesians and other Pacific races. In the majority of varieties of *Colocasia antiquorum* so far studied $2n = 28$. A triploid variety ($2n = 42$) occurs in the Cavalli Islands, NZ, where it has probably survived since the earliest known Maori settlement. Two further triploids have been identified in New Caledonia.

STIMULANTS

757 Istituto Scientifico Sperimentale per i Tabacchi. Relazione tecnica 1955.
(**Tobacco Research Institute. Report of work for 1955**).
Tabacco, Roma 1956 : **60** : 111–46.

Further tests (cf. *PBA*, XXVI, Abst. 560) with lines of Kentucky have confirmed the superiority of Palù in quality and vigour and hybrids of Kentucky Palù x Kentucky Americano have been made. A number of selections of *Nicotiana rustica* of high alkaloid content are under observation. The characteristics of the early variety Xanthy 19 Dojmi have proved dominant in a cross with a form of Perustitza with dwarf habit.

The genetical and cytological investigations referred to in earlier reports have been continued.

758 LINK, L. A. & VALLEAU, W. D.
Tobacco variety testing at the Western Kentucky Substation.
Spec. progr. Rep: Ky. Fm. Home Sci. 1955 : No. 1 : p. 8.

So far none of the experimental burley varieties combining resistance to mosaic, black root rot, black shank, *Fusarium* wilt and wild fire have equalled standard varieties in yield and quality when grown on disease-free soil.

In 1954 the experimental one-sucker dark variety DB39–51 was graded the highest of the 33 standard and experimental dark varieties tested and was second in value per acre.

759 WOLF, F. A.
Albinistic variegation of tobacco leaves, a periclinal chimera.
J. Elisha Mitchell sci. Soc. 1956 : **72** : 83–87.

The albinistic variegation described, which was found in a plant of flue-cured tobacco, was not heritable; it is ascribed to the occurrence of a periclinal chimera.

760 KUHN, H. & BÜHN, H.
Über das Auftreten von Nebenalkaloiden in Handelstabaken. (**On the presence of secondary alkaloids in commercial tobaccos**).
Fachl. Mitt. öst. Tabakregie 1956 : No. 1 : 6–13.

By means of paper chromatography, oxynicotine, nornicotine, anatabine, anabasine, myosmine and α,β-dipyridyl were shown to be present in the cured leaves of a number of Virginian and Oriental tobacco varieties. Tabulated data showing the amount of each of these substances found in the varieties tested are given (cf. *PBA*, XXVI, Abst. 2682).

761 GRIFFITH, R. B.
Quick nicotine tests aid burley breeding program.
Spec. progr. Rep. Ky. Fm. Home Sci. 1955 : No. 1 : 5–6.

Using a paper-chromatography method, the heritable character of conversion of nicotine into nornicotine during curing was detected among individual plants of standard varieties such as Ky 16 at the Kentucky Agricultural Experiment Station (cf. *PBA*, XXV, Abst. 2263). Cigarettes made with unaged tobacco from selections possessing this property were found to have off flavours and an unpleasant aroma in smoking tests. Possibly these undesirable characters would not be expressed under normal conditions of cigarette manufacture.

Selection of plants with lower nicotine content is regarded as feasible.

762 LUMANG, H., FERNANDEZ, N. & APON, C.
Progress report on the water-soluble reducing sugars and sucrose content of Virginia tobacco.
Philipp. J. Agric. 1954 (1956) : **19** : 173–78.

The moisture content, total reducing sugars and sucrose content of 20 samples of 8 varieties of Virginia tobacco were determined by the Tobacco Division. Differences were found not only between varieties but also within varieties in samples from different localities.

763 VALLEAU, W. D.
Better varieties of burley tobacco.
Spec. progr. Rep. Ky. Fm. Home Sci. 1955 : No. 1 : p. 7.

The varieties WF4–51, 17–51 and 12–53, combining resistance to wild fire, mosaic and black root rot, are being tested under experimental and commercial conditions in Kentucky. Other lines resistant to these three diseases and also to *Fusarium* wilt are approaching the test stage. Black-shank resistance has been transferred from *Nicotiana longiflora* to tobacco; burley and dark varieties resistant to the other diseases have been used as recurrent parents. Burley varieties with lower nicotine content are also being developed.

764 VALLEAU, W. D.
Improving dark tobacco.
Spec. progr. Rep. Ky. Fm. Home Sci. 1955 : No. 1 : p. 11.

Progress at the Kentucky Agricultural Experiment Station in breeding dark tobaccos combining resistance to mosaic, wild fire and black root rot is briefly reported.

Report of Progress of the Tobacco Research Board of Rhodesia and Nyasaland, 1953-1955 (1956) : Bull. No. 5 : Pp. 48.

765 *Raeber, J. G. Varietal improvement.* (*pp. 18–23*).

Breeding is being carried out at the Kutsaga Station, Salisbury. Strains possessing immunity from white mould derived from a wild type (unspecified) are being developed. Progress has been made in transferring mosaic resistance from Vamorr 50 to varieties suitable for the Rhodesian market. *Nicotiana repanda* has remained free from nematode root-knot under severe conditions of infestation; wild species resistant to wildfire, *Alternaria* and anthracnose are also available. A tobacco type failing to produce pollen has been found.

766 KÖHLER, E.
Über eine reversible, durch die Jahreszeit induzierte Virulenzänderung beim Tabak-Rattle-Virus. **(On a reversible, seasonally induced change in the virulence of the tobacco rattle virus).**
NachrBl. dtsch. PflSchDienst., Berl. 1956 : **8** : 93–94.

A strain of tobacco rattle virus, apparently undergoing cyclical seasonal variation between a winter and a summer type, is described. Plants of the variety Samsun inoculated with this strain displayed systemic mottle mosaic and necrotic browning when infected with the summer type and a pronounced discoloration of the area around the central vein when infected with the winter type. The differences in reaction are thought to be due not to a seasonal change in the reaction of the host plant but to variation in the nature of the virus.

767 KAPICA, O. S.
(Directed variability of tobacco mosaic virus subjected to high temperatures).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1955 : No. 22 : 181–207. [Russian].

A new strain of tobacco mosaic virus, distinguished by ability to reproduce at 35·5° C., was obtained by inoculating *Nicotiana glutinosa* with the acicular strain and culturing it upon the host for three days at 34·5° C.

768 AMMA, S. & HARADA, S.
(On the distribution of tea pollen by wind).
Chagyo Kenkyu Hokoku/Tea Res. J. 1955 : No. 6 : 1–2. [Japanese].

Figures are given for the percentage germination of air-borne pollen at distances of 0–10 m. from the parent plant. Germination was not seriously impaired by wind transport.

769 Tomo, N., Fuchinoue, Y. & Yamane, H.
(Studies on self fertilization of the tea plant).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **5** : 247–53. [Japanese].

The reasons for the low degree of self compatibility (0·2–4·2%) were investigated. It appears that self-pollen tubes are inhibited at the base of the style. Such treatments as bud pollination, pollination of old flowers, pollination at the end of the flowering season and hormone applications accelerate pollen-tube growth in the style but not at the base of the style.

770 Nakayama, A. & Harada, S.
(Studies on the rooting capacity of cuttings of tea-plant varieties. I. The starch content of the cutting and its rooting capacity).
Chagyo Kenkyu Hokoku/Tea Res. J. 1955 : No. 6 : 3–6. [Japanese].

A comparative study of the rooting capacity of stem cuttings of five Japanese varieties showed that rooting ability was, in general, correlated with the amount of starch present.

771 Nakayama, A. & Harada, S.
(Studies on the rooting capacity of cuttings of tea-plant varieties. II. Varietal differences in response to hormones).
Chagyo Kenkyu Hokoku/Tea Res. J. 1955 : No. 6 : 7–9. [Japanese].

Using the same five varieties as in the experiments described in Abst. 770, it was shown that improvement in rooting capacity of stem cuttings in response to α-naphthaleneacetic acid is correlated with starch content.

772 Barua, D. N.
Calcium oxalate crystals as an index of nutrient uptake in the tea plant.
Curr. Sci. 1956 : **25** : 249–50.

Differences have been found between clones in the number of crystals of calcium oxalate present in the phloem. This number may be used as a measure of the nutrient uptake of the plant.

773 Harada, S., Watanabe, A. & Sakai, S.
(Studies on the frost resistance of tea varieties).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 39–45. [Japanese].

The relative susceptibility to frost damage of a series of Japanese varieties was determined, following a light June frost at Kanaya, Shizuoka. Resistance was correlated with late flushing and high refractive index of the sap. There is considerable variation in refractive index between varieties with simultaneous flushing dates.

774 **Eighth Annual Report of the Research Department of the Coffee Board, Balehonnur, S. India, 1954-55** : Bull. No. 8 : Pp. 94.

Breeding for vigorous growth, field resistance to *Hemileia vastatrix* and yield has continued at Balehonnur. Field studies have been made of advanced generations, hybrids and selections from estates elsewhere in India, together with comparative trials of clonal progeny of both *Coffea arabica* and *C. robusta*. The clonal trials have been free of disease since planting. Three selections have proved satisfactory and are being grown more extensively on coffee estates. They are (1) S288 (derived by selfing S26), which is vigorous in growth, though up to 25% of the plants may show susceptibility to races I and II of *H. vastatrix*, (2) S795 (S288 x Kents *arabica*), which is similar to S288 but produces larger beans, and (3) S333 (S31 x S22), which is also similar to S288 but up to 10% of the seedlings have a tendency to develop temporary chlorosis in the nursery stage. The chromosome number of all three is $2n = 44$, and mitosis and meiosis are regular. A number of interspecific crosses have been made, involving *C. stenophylla*, *C. liberica*, *C. robusta*, *C. arabica*, and *C. eugenioides*, and field studies are being made of their progenies. Seed material has been received from other countries and the seedlings raised are being studied under Indian conditions.

775 Jolly, A. L.
Clonal cuttings and seedlings of cocoa.
Trop. Agriculture, Trin. 1956 : **33** : 233–37.

Data on an estate field in Trinidad planted in 1941 with cuttings of the clones ICS1, ICS45 and ICS95 and with open-pollinated seedlings of these clones have indicated the superiority of the cuttings in yield of dry cocoa per acre per annum.

776 Desrosiers, R., Buchwald, A. von & Bolaños, C. W.
Selección en masa de plántulas de cacao con base a su resistencia a la escoba de bruja. **(Mass selection of cacao seedlings on the basis of their resistance to witches' broom).**
Turrialba 1955 : **5** : 134–38.

The cacao plantations of Ecuador consist of a mixture of trees belonging to the Nacional and Trinitario types, the latter being mostly hybrids of Criollo and Forastero. Artificial inoculations of a large number of seedlings showed that the Nacional types were all susceptible to *Marasmius perniciosus* but among the Trinitario seedlings several resistant plants were found. By mass selection after inoculation the proportion of resistant plants was increased considerably and in this way it is thought possible to select resistant lines of improved quality.

777 **Institute of brewing hop trials: 1954 crop.**
J. Inst. Brew. 1956 : **62** : 304–08.

The results are given of the physical examination, soft resin analysis and performance in copper and dry hopping of six varieties tested under commercial conditions in 1954. D1 gave slightly disappointing results compared with previous trials (cf. *PBA*, XXV, Abst. 1312) but is nevertheless thought worthy of retention. J2 and OT48 are also considered to be useful varieties, the former having the added advantage that its hops store well. Of the wilt-tolerant group of Wye varieties, which comprises C2, D3 and OT48, D3 appears to be the most satisfactory. V94, which lends itself to mechanical picking, and C2 are thought unlikely to find much favour with brewers.

MINOR CROP PLANTS

778 KORMOS, J. & KORMOS, J.
Determinált paprikák. (**Determinate growth in red pepper**).
Növénytermelés 1956 : **5** : 1–10.

In crossing *Capsicum annuum* varieties of the fasciculate type, in which the main axis stops growing and flowers are borne in terminal clusters on the long lateral shoots, with non-fasciculate peppers, in which growth is cymose and indeterminate and the flowers are borne singly, F_2 plants were obtained in which the main axis is terminated by the inflorescence and no lateral shoots develop. The inheritance and possible breeding value of the last mentioned fully determinate character and a series of forms intermediate between this and the indeterminate type are being investigated.

779 GREENLEAF, W. H.
Inheritance of resistance to tobacco-etch virus in *Capsicum frutescens* and in *Capsicum annuum*.
Phytopathology 1956 : **46** : 371–75.

Resistance to the tobacco etch virus in the Peruvian introduction *C. frutescens* (PI152225) was determined by a single recessive gene designated et^{t}, the dominant allele being et^{t+}. Resistance in the Cayenne variety *C. annuum* 'SC46252' was also recessive and monofactorially determined, the dominant and recessive alleles being et^{a+} and et^{a} respectively. SC46252 appeared also to carry modifying genes which, in some F_2 plants and among the progeny of selfed, highly resistant individuals, conferred apparent immunity. It is not known whether the major genes in the two species are allelic. Since an interspecific sterility barrier was apparent when the intraspecific *C. frutescens* hybrid PI152225 x Tabasco was crossed with a pimento variety of *C. annuum* and since the resistance of PI152225 is lower than that of SC46252, the last-mentioned variety is regarded as being of more promise for breeding resistant *C. annuum* varieties.

780 DAS, K. & VARMA, S. C.
Effect of selfing within cloth bags on length and number of seeds per pod in rai (***Brassica juncea* Czern. and Coss.**)
Sci. & Cult. 1956 : **21** : p. 673.

Within a variety, average length of pod and number of seeds per pod were smaller when the flowers were bagged than when they were open pollinated.

781 Winterkoolzaad, 1956. (**Winter rape, 1956**).
Landbouwvoorlichting 13 : Bijl. 11; Ber. Rassenkeuze 1956 : No. 208 : unpaginated.

The results of trials of four varieties on different types of soil in the Netherlands are presented. The new variety Gebrüder Dippe's (platzfest) [Dippe Bros. Indehiscent] gave the highest yields on clay soils and Lembke and Matador gave the highest yields on loess soils.

782 Nya orginalsorter. (**New original varieties**).
Försök o. Forskn. 1956 : **13** : p. 63.

Selections receiving the designation "original" include, in addition to new strains of commercial varieties of fescue, carrot and cauliflower, the autumn turnip rape Duro (Rapido x Lembkes), which combines the hardiness of the first parent with the productivity of the second.

783 HOGG, P. G.
New crops tested at Delta Branch Station. Castorbeans.
Miss. Fm. Res. 1956 : **19** : No. 2 : p. 1.

After trials at the Delta Branch Experiment Station, Cimarron Hybrid, Cimarron and Custer Hybrid are recommended for growing in the Mississippi delta region.

784 Seshadri, C. R. & Seshu, K. A.
Preliminary observations on jassid injury in castor.
Madras agric. J. 1956 : **43** : 197–99.

Observations at Coimbatore suggest that varieties with leaves covered with a waxy bloom are more resistant to jassid (*Empoasca flavescens*) than varieties lacking this bloom, the production of which appears to be heritable.

785 Cook, A. A.
Varietal response of castorbean to tobacco ring spot virus.
Plant Dis. Reptr. 1956 : **40** : 606–10.

Thirty-two varieties were inoculated with tobacco ring spot virus. Cimarron and N224A–1–1–1 showed symptoms of infection but were never killed; Custer showed a similar response, but about one quarter of the plants were killed.

786 Horowitz, M., Marani, A. & Lahover, D.
(**Tests with linseed varieties**).
Sadeh (Field)/Hassadeh 1956 : **36** : 217–19. [Hebrew].

Four varieties were compared in a field trial. Cyprus, a Mediterranean type, gave the highest yield of seeds (825 kg. per ha.), but was lowest in both yield of deseeded straw and of long fibre. Minnesota, from North America, gave the lowest yield of seeds but had the highest yield of deseeded straw (4·4 tons per ha.) and long fibres (550 kg. per ha.). The possibility of utilizing the fibres of linseed varieties is discussed.

787 Šimansjkiĭ, M. K.
(**Intervarietal hybridization of linseed**).
Dopov. Akad. Nauk Ukraïn. RSR (Proc. Ukrain. Acad. Sci.) 1956 : No. **2** : 189–91. [Ukrainian].

An abridged account of the report summarized in *PBA*, XXVI, Abst. 3638 is given.

788 Mello, L. M. de & Castro, D. R. de
Observações sobre algumas formas cultivadas de linho para óleo. I. Relação entre os índices de iodo e de refracção. (**Observations on some cultivated forms of linseed. I. Relation between iodine and refractive indices**).
Agron. lusit. 1956 : **18** : 61–73.

In analyses of the oil from a number of specimens, including both Portuguese and imported varieties, a correlation of r = +0·91 was observed between the refractive index and the iodine number and it is concluded that it is quite safe to use the former in assessing the oil quality.

789 Choudhuri, H. C. & Banerjee, H. T.
Sunflower as oilseeds and fodder crop in West Bengal.
Sci. & Cult. 1956 : **21** : 675–77.

In a trial at the State Agricultural Research Institute, Tollygunge, Giant Russian proved to be the best type as regards grain and fodder yield but was inferior in oil percentage to West Bengal local. There is therefore scope to combine the good characteristics of these types by hybridization.

790 Pančinko, A.
(**For quicker and fuller utilization of the new resources**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1956 : No. **6** : p. 14. [Russian].

Mention is made of new sunflower varieties with an oil content up to 49%. They were bred at Krasnodar, Veĭdelevka and Armavir.

791 Putt, E. D. & Rojas M., E.
Estudios sobre herencia de la resistencia a la roya del girasol (*Helianthus annuus* L.) en condiciones de campo. [**Studies on the inheritance of resistance to rust in sunflower (*H. annuus* L.) under field conditions**].
Inf. mens. Estac. exp. agríc. La. Molina 1956 : **30** : No. 343 : 1–9. (Mimeographed).

This is a Spanish version of the paper referred to in *PBA*, XXVI, Abst. 2733.

792 Riedl, W. A.
Safflower in Wyoming.
Bull. Wyo. agric. Exp. Sta. 1955 : No. 332 : Pp. 10.

Of the varieties tested for four or more years under irrigated conditions at the Torrington Substation, Wyo., N–6 gave the highest yield of grain and oil per acre but was lower in oil content than N–8 and N–10. Under non-irrigated conditions at other substations, N–10 had the highest oil content and produced the highest yield of oil; it was equalled in grain yield by N–8.

793 Morton, J. K.
Cytotaxonomic studies on the Gold Coast species of the genus *Commelina* Linn.
J. Linn. Soc. 1956 : **55** : 507–31.

Chromosome numbers are reported for 16 species including three newly described species. The most common basic number is $x = 7$, most species having $2n = 28$ or $2n = 56$; there also appears, from this and other work, to be another series with $x = 5$. Each species is described in detail and a key to identification is provided.

794 Chládek, M. & Rod, J.
Příspěvek k pěstování a šlechtění ibišku (*Althaea officinalis* L.). (**The problems of cultivation and breeding of *A. officinalis***).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1956 : **29** : 43–58.

At Pohořelice the clones obtained by division of one year-old plants surpassed in yield and quality two-year old plants raised from seed. The tallest plants at the onset of flowering gave the best material for vegetative reproduction.

795 Monachino, J.
The sarmentogeniferous variety of *Strophanthus sarmentosus*.
Bull. Torrey bot. Cl. 1956 : **83** : 281–88.

The author gives the chemical variant well-known for its high percentage of sarmentogenin the status of var. *senegambiae* of the above species and describes its distinctive botanical features.

796 Mehra, P. N. & Sobti, S. N.
Cytology of Indian medicinal plants. II. Aconites, valerians and senna.
Res. Bull. Panjab Univ. 1955 : 159–71.

Aconitum laeve, *A. chasmanthum*, *A. violaceum*, *A. heterophyllum* and *A. kashmiricum*, were found to be diploids ($n = 8$); *A. dienorrhizum* had $n = 16$. Other chromosome numbers reported are: *Valeriana hardwickii*, $n = 28$; *V. stracheyi*, $2n = 16$; *V. wallichii*, $2n = 32$; and *Cassia angustifolia*, $n = 13$. According to the observations of the authors and other investigators, sect. *Lycotonum* of *Aconitum* consists only of $2n$ species but sect. *Euaconitum* contains $2n$ and polyploid members, in *Aconitum* $x = 8$, in *Valeriana* $x = 7$ and 8, and in *Cassia* $x = 6$, 7 and 13. The basic number of 13 in the last-mentioned genus probably arose as the result of amphidiploidy between species with $x = 6$ and 7.

797 de Silva, C. A.
Recommended rubber planting material (1955).
Quart. Circ. Rubb. Res. Inst. Ceylon 1955 : **31** : 78–91.

Descriptive notes are given on clones and clonal seedlings recommended for planting in Ceylon.

FRUITS AND NUTS

Journées scientifiques des fruits et légumes. (**Scientific meeting on fruits and vegetables**).
Ann. Nutr., Paris 1955 : **9** : Nos. 5–6 : Pp. 465.

798 *Schuphan, W. La valeur nutritive des différents légumes-feuilles et sa variation en fonction des variétés et des conditions écologiques. (The nutritive value of the different leaf vegetables and its variation as a function of variety and ecological conditions). (pp. 67–93).*

The vitamin contents and nutritive values of cabbage, cauliflower, Brussels sprouts, spinach, lettuce and endive are compared and mention is made of the influence of variety and of cultural, climatic and weather conditions on the nutritive value of these vegetables.

799 *Ribereau-Gayon, J. Maturation du raisin en fonction du climat et du cépage. (Ripening of the grape as a function of climate and variety). (pp. 95–112).*

The effect of climate on the chemical composition of the mature grape is discussed with reference to differences between the varieties Merlot and Cabernet-Sauvignon.

800 *Flanzy, M. Caractéristiques des raisins: raisins à vins, raisins de table et raisins à jus de fruits. (Characteristics of grapes: wine grapes, dessert grapes and grapes for fruit juice). (pp. 113–41).*

Data are provided on the chemical composition and quality of the principal varieties of grape grown in France for the making of wine, for dessert purposes and for the commercial extraction of grape juice.

801 *Tavernier, J. & Jacquin, P. Qualité des pommes et des poires en fonction des variétés. (Quality in apples and pears as a function of variety). (pp. 143–71).*

Information is given on the appearance, flavour, keeping properties, vitamin contents and biochemical composition of some of the more important varieties of apples and pear grown in France.

802 *Peynaud, E. & Caillavet, H. Qualité des pêches et des prunes en fonction des variétés. (Quality in peaches and plums as a function of variety). (pp. 173–90).*

Work at the Bordeaux Agronomic Research Station and at the Research Station for Viticulture and the Cultivation of Fruit Trees in the

South East in developing new peach and plum varieties of attractive appearance and good flavour and resistant to damage during transportation is reviewed briefly and data are provided on the biochemical properties of the more important varieties grown at these two stations.

803 *Diehl, R. Qualité des pommes de terre en fonction des variétés. (Quality in potatoes as a function of variety). (pp. 191–203).*

Factors influencing the choice of varieties for human consumption, for feeding livestock and for the commercial extraction of starch are discussed with reference to the biochemical constituents of the potato and the effect of storage on cooking quality and nutritive value.

804 *Sanfourche, G. Qualité des tomates en fonction des variétés. (Quality in tomatoes as a function of variety). (pp. 205–15).*

The requirements of the grower and consumer as regards earliness, yielding ability, resistance to diseases and cracking and quality, flavour and appearance of the fruit are discussed with reference to the more important varieties at present grown in France.

805 *Fourmont, R. & Mayer, R. Établissement d'un catalogue officiel des variétés de fruits et légumes. (Establishment of an official catalogue of fruit and vegetable varieties). (pp. 221–31).*

The morphological, physiological, cultural and economic criteria employed in deciding whether a given variety is to be included in the French official catalogue are outlined and a plea is made for the establishment of an international catalogue of fruit and vegetable varieties.

Föreningen för Växtförädling av Frukträd, Balsgård, Verksamhetsåret 1955. (**Association for Fruit-tree Breeding, Balsgård. Working year 1955**) : Pp. 24.

806 *Nybom, N. Pågående arbetsuppgifter. Avd. I. Kärnfrukter och bärbuskar. (Reports on current work. Section I. Pome fruits and bush fruits). (pp. 7–12).*

Apple. Crosses have been effected among Golden Delicious, McIntosh, Lobo, Dronning Louise [Queen Louise], Cox's Orange, Ontario, Oretorprenett [Oretorp Reinette] and others with the aim of combining good storage quality, good eating quality and attractive appearance; and among Early McIntosh, Melba, Gyllenkroks Astrakan, Worcester Pearmain, Stenkyrke and Stenbock [Ibex] with the object of obtaining improved autumn varieties. In an attempt to produce hardy varieties, Lobo and Melba have been crossed with F_1 plants of *Malus baccata* x Transparente Blanche [White Transparent]. The process of transferring scab resistance from *M. floribunda* to cultivated varieties has reached the third and fourth backcross generations. A colchicine-treated Cox's Orange, Cox **41**, is thought to be at least partially tetraploid, since its progeny includes several triploids. Tetraploids of Ontario and Jonathan are also being used in the production of triploids.

Pear. The following crosses have been effected: Esperens Herre (= Seigneur d'Esperen) x Doyenné du Comice, Lybeckerbergamott [Lübeck Bergamot] x Esperens Herre, Johantorp x Esperens Herre and Moltke x Esperens Herre.

Bush fruits. A number of breeding projects have been initiated, including the production of true-breeding raspberry lines by continued self pollination and the improvement of vigour in spineless gooseberries and blackberries by irradiation.

807 *Oldén, E. J. Pågående arbetsuppgifter. Avdelning II. Stenfrukter, jordgubbar, grundstammar och hassel. (Reports on current work. Section II. Stone fruits, strawberries, rootstocks and hazel). (pp. 12–15).*

Plum. Crosses have been carried out between Jefferson on the one hand and Mount Royal, Coates, Victoria and Columbia on the other, with the intention of combining the good quality of the first-mentioned with the large fruits and attractive appearance of the other varieties. Mälar, Tuna, Hardy Blue Seedling and Mount Royal have been used to improve the hardiness of varieties of good quality. Ruth Gerstetter, Early Laxton and Bonne de Bry have been employed in breeding for earliness.

Cherry. In breeding for hardiness, Allmän Svart Bigarrå [Common Black Bigarreau], Merton Heart, Schreckens Bigarrå [Schrecken's Bigarreau], Steckmans Bunte [Steckman's Motley] and Zuckerbunte [Sugar Motley] have been used as parents. A number of sour cherries have been crossed with Ostheimer, Brysselska Bruna [Brussels Brown], the Russian variety Šyrpotrep and another Russian sour cherry referred to as Griotte Kirchhelinsky.

Strawberry. With a view to obtaining productive disease-resistant varieties with large, bright red fruits good in quality and flavour, crosses have been carried out among several of the new Senga varieties and the American strawberries Blakemore, Catskill, Dunlap, Howard 17, Marshall, Northwest, Shasta and Sparkle.

Report of the Horticultural Experiment Station and Products Laboratory, Ontario Department of Agriculture, 1951 and 1952. Pp. 93.

Investigations at the Horticultural Experiment Station, Vineland, Ont., included the following:—

808 *Kerr, E. A., Willison, R. S. & Dickson, G. H. The nature of certain leaf abnormalities in sweet cherry.* (*p. 31*).

Crinkled and mottled leaves in the sweet cherries Hedelfingen and Black Tartarian respectively are under investigation as abnormalities of possible genetic origin (cf. Abst. 274).

809 *Kerr, E. A. & Robb, O. J. Improvement, by breeding, of sweet potatoes for Ontario conditions.* (*p. 31*).

Tests are to be carried out on a wide range of varieties as a preliminary to breeding.

810 *Dickson, G. H. Pear breeding,* 1913–1952. (*pp. 32–37*).

The results of controlled intervarietal crossing and of open pollination are summarized. In the controlled hybridizations, supposedly blight-resistant varieties were crossed with good-quality commercial varieties, particularly Bartlett. No seedlings reaching commercial standard have been obtained but a number show promise for further breeding. The latter include selections of Bartlett x PI26485.

811 *Lipsit, R. R. Edible nuts, varieties and seedlings.* (*pp. 38–41*).

An historical outline is given of trials of varieties and seedlings of filbert, walnut, hickory, Chinese chestnut and other nuts.

812 *Bradt, O. A. Grape variety tests.* (*p. 41*).
Hybrids 29143, 35054, 37024, 370517 and 370625, developed at the station, show particular promise as grapes for wine. French hybrids have proved to be especially valuable in breeding. Using these varieties and also selections developed at the Vineland Station and the New York State Agricultural Experiment Station, Geneva, many new crosses have been effected.

813 *Kerr, E. A. Jointless tomatoes.* (*p. 43*).
Breeding to incorporate the jointless character into commercial varieties has resulted in a few fairly satisfactory selections which are to be further crossed with suitable varieties.

Report of the Horticultural Experiment Station and Products Laboratory, Ontario Department of Agriculture, 1953 and 1954. Pp. 153.

The following breeding is reported from the Horticultural Experiment Station, Vineland, Ont.:—

814 *Bradt, O. A. General improvement with particular emphasis on cropping dependability.* (*p. 69*).

The prospects of breeding apricots adapted to Ontario are considered to be good.

815 *Dickson, G. H. Plum breeding,* 1913 *to* 1937. (*pp. 69–76*).

The main aim of breeding is the development of varieties providing a seasonal succession of high-quality plums of the prune type. Information is given on the hybrids obtained by controlled and open pollination. The selections made in 1954 were derived from the following crosses: Golden Drop x Grand Duke; crosses of Imperial Epineuse with Grand Duke, Golden Drop, Italian Prune and President; Shiro x Burbank; Shiro x Reine Claude; Pacific x Albion; and Pacific x Golden Drop. Two seedlings from open-pollinated Pacific have also been retained.

816 *Kerr, E. A. Breeding for resistance to leaf mold in greenhouse tomatoes.* (*pp. 76–80*).

One of the objectives of breeding greenhouse tomatoes is the combination of as many factors for resistance to leaf mould (*Cladosporium fulvum*) as possible in single varieties. Many accessions of wild species of *Lycopersicon* have proved to be highly resistant to all known races. The occurrence of dominant genes for resistance or immunity to race 6 which attacks plants containing Cf_1, Cf_2 and Cf_3 for resistance has already been detected in several accessions. The genes for resistance or immunity so far tested have been independent of *a*, *al*, *br*, *c*, *d*, *dm*, *e*, *f*, *H*, *j*, *l*, *lf*, *mc*, *nc*, *r*, *wt* and *y*.

Vagabond, immune from all known races of *C. fulvum*, was introduced in 1954 (cf. *PBA*, XXV, Abst. 2434). A group of lines deriving their immunity to all known races from *L. peruvianum*, *L. pimpinellifolium* and *L. hirsutum* are now undergoing commercial trial.

Of the F_1 hybrids tested, V–512 (B121 x Michigan State Forcing) has shown promise in yielding capacity and other characters. A line of B–121 carrying *ps* for "position sterility" has been developed for possible use in the production of F_1 hybrid seed.

817 *Vagabond tomato.* (*pp. 80–84*).

Notes are given on the origin and characteristics of Vagabond, which is recommended as a leaf-mould immune variety for spring or autumn cultivation in the greenhouse (cf. Abst. 816).

818 *Haarlem, J. R., Crowther, R. P. & Truscott, H. L. Variety tests of grapes for wine.* (*p. 130*).

The results of tests carried out at the Horticultural Products Laboratory during 1950–54 on the wine quality of 39 varieties grown in Canada are reported in detail.

Proceedings of the 101st Annual Meeting of the New York State Horticultural Society: Proceedings of the Seventieth Convention of the American Pomological Society: 1956 : 70 : Pp. 352.

819 *Allen, W. L. What's new in strawberries?* (*pp. 38–40*).

Breeding for increased yields and improved quality of fruit and resistance to red stele and nematodes in the USA is discussed in general terms and some of the more promising strawberry varieties that have been developed by the US Department of Agriculture and the various state experiment stations in the past twenty years are listed.

820 *Tukey, H. B. Varieties of the past and for the atomic age.* (*pp. 87–94*).

A brief review of fruit breeding in the USA since 1848 is given and future prospects are discussed. It is thought that the use of atomic power will influence fruit breeding in two respects. Entirely new varieties will be required for the greatly altered conditions that will prevail in agriculture as cheap power becomes available and breeding will be accelerated by the use of atomic radiation to induce mutations.

821 *Shaulis, N. Looking ahead with grape growers.* (*pp. 126–32*).

The expansion of the dessert grape industry in New York State by the planting of new superior varieties such as Steuben, Romulus and Concord and by the use of *Phylloxera*-resistant rootstocks is discussed.

822 *Burrows, F. W. Production and planting trends in the apple industry.* (*pp. 242–51*).

Statistical data are presented on the distribution of the more important varieties within the USA and future breeding aims are outlined briefly. At the present time the grower requires improved, early-maturing varieties with red skins and very late varieties of improved quality in order to prolong the harvesting period.

823 LOEWEL, E. L. & KARNATZ, H.
Untersuchungen über die Frostresistenz der Obstgehölze im Baumschulstadium. **(Investigations on the frost resistance of fruit trees in the nursery stage).**
Züchter 1956 : **26** : 117–20.

A mobile refrigerator plant is described which enables fruit trees to be tested for frost resistance in the field.

Second symposium on virus diseases of fruit trees in Europe, August 23-27, 1955, Wageningen, Netherlands.
Tijdschr. PlZiekt. 1956 : **62** : 33–88.

The following papers, read at the above symposium held in Wageningen, Netherlands, on 23 to 27 August, 1955, will be of interest to readers of *Plant Breeding Abstracts*.

824 *Stankovic [Stanković], D. A new method suggested for breeding fruit trees resistant to virus diseases.* (*pp. 76–79*).

The author suggests that it may be possible to breed fruit trees resistant to virus diseases by treating the reproductive cells with appropriate nucleic acids and quotes Russian and other East European research workers in support of the hypothesis that biochemical changes in the cell may be induced by this method and the hereditary constitution of the plant changed.

825 *A standard minimum range of indicator varieties for fruit tree virus in Europe.* (*pp. 87–88*).

A list of suggested indicator varieties for various virus diseases of apple, pear, cherry, plum and peach is provided.

826 PRATT, C.
Can atomic energy improve fruits?
Fm. Res. 1956 : **22** : No. **3** : p. 3.

A technique devised at the Brookhaven National Laboratory, Upton, NY, to study the effects of cobalt irradiation on apples and grapes is described. A pipe containing radioactive cobalt is erected in the middle of a field and the plants are placed in concentric circles around it. It is hoped to obtain commercially valuable mutants by this method.

827 BLAIR, D. S.
Edgar apple.
Fruit Var. hort. Dig. 1955 : **10** : p. 40.

Later ripening than McIntosh, Edgar was developed from McIntosh x Forest at the Central Experimental Farm, Ottawa. Since it is less productive than McIntosh, it is recommended to growers for trial only.

828 Ellenwood, C. W. & Fowler, T. E.
Some new apple varieties.
Res. Circ. Ohio agric. Exp. Sta. 1956 : No. 34 : Pp. 8.

Descriptive notes are given on varieties under trial at the Ohio Agricultural Experiment Station, together with an indication of their value for commercial planting.

829 Schander, H.
Über die Ursachen von Gewichtsunterschieden bei Samen von Kernobst (Apfel und Birne). II. Der Einfluss verschiedener Erb- und Umweltfaktoren auf die Beziehungen zwischen Samen und Frucht. [**On the causes of differences in weight in the seeds of pome fruits (apple and pear). II. The influence of different hereditary and environmental factors on the relationships between seeds and fruit**].
Z. Pflanzenz. 1956 : **36** : 31–80.

Studies were carried out on the influence of hereditary and environmental factors on the relationship between seed size and weight on the one hand and fruit size and number of seeds per fruit on the other in several diploid apple and pear varieties (cf. *PBA*, XXVI, Abst. 643). Competition between seeds, between fruits and seeds, and between fruits for the supply of available nutrients proved the most important series of factors determining the weight of the seeds, a high number of seeds per loculus or per fruit or a high number of fruits per spur or per branch resulting in a low 1000-seed weight. A positive correlation was established between seed number and fruit size when the seed number was relatively low, as hormones produced by the seed assisted in promoting the growth of the fruit, but when a large number of seeds were present competition between seeds and fruits resulted in a reduction in the size of the fruit. Shortage of water resulted in a reduction in fruit size but exercised little influence on seed weight. A low leaf area per fruit per branch favoured the development of the seeds at the expense of the fruit whereas a high leaf area per fruit per branch favoured the competitive ability of the fruit with respect to the seeds; the influence of leaf area per fruit was more pronounced in the lower branches of a tree than in the upper branches. The number of loculi per fruit, the potential number of seeds per loculus and the number of flowers per spur were varietal characteristics; environmental factors influencing fruit set, and consequently seed weight, included amount of pollen available, the variety of the pollinator, distance between trees, weather conditions at time of pollination, presence or absence of pollinating insects and the extent of June fruit-drop, fruits with a low number of seeds tending to drop more readily and thus affecting the average seed number, and consequently seed weight, of the total fruits harvested.

830 Byrde, R. J. W.
The varietal resistance of fruits to brown rot. I. Infection experiments with *Sclerotinia fructigena* Adherh. and Ruhl. on certain dessert, culinary and cider varieties of apple.
J. hort. Sci. 1956 : **31** : 188–95.

Fruits collected from 11 varieties were tested for resistance to brown rot following artificial injury of the fruit skin. The cooking apple Edward VII showed significant resistance to the spread of the pathogen through the fruit from an established infection and the bitter-sweet cider varieties Yarlington Mill, Chisel Jersey and Dabinett were resistant to infection of freshly made wounds by spores of the fungus.

831 Lamb, R. C. & Hamilton, J. M.
Breeding scab-resistant apples.
Fm. Res. 1956 : **22** : No. **3** : p. 15.

A preliminary account of breeding for resistance to *Venturia inaequalis* at the New York State Experiment Station, Geneva, is given. Some 360 scab-resistant seedlings have been obtained from crosses effected in 1949 between susceptible cultivated varieties and *Malus floribunda*, *M. toringo*, *M. niedzwetzkyana* and selections of Russian apples. These seedlings are now being back crossed to the susceptible cultivated varieties.

832 Mišić, P.
Pojava ružičastocrvene boje antera i mikrosporogeneza kod kruške (*Pyrus communis* L.). [**The appearance of pinkish-red colour in the anthers and microsporogenesis in pears (*P. communis L.*)**].
Arh. poljopr. Nauk. 1955 : **8** : No. 21 : 77–81.

Observations at Čačak showed that pink coloration of the anthers, visible only by daylight, occurs at the time of meiosis of the pollen mother cells.

833 Breviglieri, N. & Baldassari, T.
Ricerche sull'impollinazione del pero nel Ferrarese. (**Research on the pollination of the pear in the Ferrara province**).
Ann. Sper. agr. 1956 : **10** : 1345–82.

Flowers of 25 pear varieties were bagged with and without emasculation. The results showed them all to be self incompatible; in certain years some varieties produced a number of fruits by parthenogenesis whereas in other years they produced none. Even in Williams, which in some years gave a good set of parthenocarpic fruits, the set was improved by artificial cross pollination and data are presented which indicate the best pollinators for each variety.

834 Maris McArthur-Hespe, G. W. F.
The activity of starch-hydrolysing enzymes in pears during development and cold-storage.
Acta bot. neerl. 1956 : **5** : 200–13.

Varietal differences in rise in α-amylase content shown by Doyenné Boussoch, Conférence and Comtesse de Paris during cold storage paralleled disparities in potentiality of ripening after storage. The ratio between the value for α-amylase activity during storage at a given time and that at commercial picking time provided an indication of whether the pears would still ripen or not. Possibly a particular variety has its own critical ratio.

835 Pénzes, A.
Galagonya (*Crataegus*) - tanulmányok. [**Studies on hawthorn (*Crataegus*)**].
Kertész. szőlész. Főiskol. Évkön. 1956 : **2** : 107–37.

In this taxonomical study of the *Crataegus* species of the Carpathian basin, numerous new forms of *C. monogyna* and *C. oxyacantha* and two of *C. calycina* are described, illustrations being provided of the chief distinguishing characteristics of the leaves and fruits of each type. A few interspecific hybrids are also described.

836 Burmistrov, A. D.
(**The sweet cherries of the Latvian SSR**).
Latv. PSR Zināt. Akad. Vestis 1955 : No. 6 : 21–32. [Russian].

Latvian forms of sweet cherry distinguished by high yield, hardiness, good transportability and fine quality are described. Most are seedlings of unknown origin but breed true to type. Forms with pink or red fruits from the districts of Alūksne, Alsunga and notably Edole are characterized by large fruits with soft or compact flesh of excellent flavour. Forms from the Madona district produce smaller red or dark red fruits with coloured juice. All the above varieties ripen in July-August and are surpassed in earliness by Spriksteljskaja Rannjaja [Early Sprikstelj] which was selected from a form in the Dobele district. This ripens in June and produces red fruits weighing 2·4 g. each. Spriksteljskaja Černaja [Black Sprikstelj] is another recent selection from Dobele. It is notable for great hardiness.

837 Schmadlak, J.
Beobachtungen über die Frostempfindlichkeit von Süsskirschensorten im Winter 1954/55. (**Observations on the susceptibility to frost of sweet cherry varieties in the winter of 1954-55**).
Dtsch. Gartenbau 1956 : **3** : 167–68.

Trials at the Fruit Research Station, Magdeburg-Ottersleben, on varieties of sweet cherry included in the East German list of approved varieties showed that only Teickners Schwarze Herzkirche [Teickner's Black Heart cherry] and Grosse Germesdorfer [Large Germesdorf] were resistant to frost damage during the winter of 1954–55.

838 Mann, A. J. & Keane, F. W. L.
The Spotlight peach in British Columbia.
Fruit Var. hort. Dig. 1955 : **10** : p. 50.

The hardy, yellow-fleshed semifreestone peach Spotlight, developed at the Summerland Experimental Station from Veteran x Rochester, ripens about a week earlier than Rochester and at the same time as Redhaven. Its canning quality is slightly superior to that of Redhaven.

839 Lalatta, F.
Le odierne conoscenze sulla trasmissione dei caratteri ereditari nel pesco. (**Present knowledge on the transmission of hereditary characters in the peach**).
Riv. Ortoflorofruttic. ital. 1956 : **40** : 255–70.

A review is given of published data on the mode of inheritance of characters such as habit, leaf colour, presence and form of leaf glands, number and position of floral buds, frost resistance, chilling requirements and time of flowering, flower form, pollen sterility, time of ripening, colour, pubescence and quality of fruit, characters of the stone and resistance to nematodes. The correlation between presence of leaf glands and resistance to mildew has been confirmed by the author.

840 Johnston, S.
Halehaven and Redhaven as parents in peach breeding.
Fruit Var. hort. Dig. 1955 : **10** : p. 56.

It is noted that Halehaven and Redhaven have proved to be outstandingly good parents in breeding in the USA.

841 Mowry, J. B.
The Hinners Hale peach.
Fruit Var. hort. Dig. 1955 : **10** : p. 34.

The yellow freestone variety Hinners Hale, which originated as a bud sport of J. H. Hale discovered in 1932 in a commercial orchard in Illinois, is briefly described. At present plantings of this variety account for 2·4% of the peach trees in Illinois. The variety matures 3 or 4 days after Elberta and its fruits remain on the tree nearly a week after maturity.

842 Baldini, E.
Indagini e considerazioni su due casi di mutazione gemmaria nel pesco. (**Investigations and considerations on two cases of bud mutation in the peach**).
Riv. Ortoflorofruttic. ital. 1956 : **40** : 300–10.

Branches bearing nectarines which appeared on normal peach trees of the varieties Vincitore [Victor] and Palazzina transmitted the mutant character when bud-grafted on to normal peach trees. This is taken as further evidence in favour of the view that the nectarine has originated from the peach by bud mutation rather than by distant hybridization.

843 Yeager, A. F. & Meader, E. M.
A flesh-color chimera in the peach.
J. Hered. 1956 : **47** : 77–78.

A single branch on a seedling tree with white-fleshed fruits, the result of a cross between the yellow-fleshed variety Eclipse and a white-fleshed Caucasian peach, bore a number of yellow-skinned fruits with partly white and partly yellow flesh; the remaining fruits borne by the mutant branch were yellow throughout except for a thin line of white flesh at the suture.

844 Dermen, H.
Histogenetic factors in color and fuzzless peach sports.
J. Hered. 1956 : **47** : 64–76.

Two sports found in Maryland are described, one in which normally yellow fruits were largely white with patches of yellow flesh and one in which the fruit skin was partly smooth. The yellow flesh appeared to result from mutation in the cell layer L–II of the shoot apex and the nectarine character from mutation in L–III.

845 Spurling, M. B.
Canning peach varieties.
J. Dep. Agric. S. Aust. 1956 : **59** : 399–402.

Information is given on the orchard and canning performance of varieties tested in South Australia. The varieties comprise established ones and introductions from the USA and South Africa.

846 Jacoboni, N.
L'azione del gelo sul pesco considerata su cultivar in Umbria. (**The effect of frost on the peach, with special reference to its effect on the cultivars of Umbria**).
Ital. agric. 1956 : **93** : 573–600.

A detailed description is given of the damage done to peach varieties in the above region during the severe winter of 1955–56. The variety least adversely affected was Montecorona. Elberta and Charles Ingouf also receive favourable mention.

847 Benemerito, A. N.
Citrus fruit juices.
Philipp. J. Agric. 1954 (1956) : **19** : 153–60.

A study was made of the juice content of 25 citrus varieties grown in the Philippines. The King orange contained the greatest quantity of juice. The widely-grown Szinkom mandarin is also of value for juice production. Calamondin was also recommended, although containing the smallest amount of juice, because it will bear throughout the year.

848 Zabala, S.
Daños provocados por las heladas en plantaciones cítricas. (**Damage caused by frosts in citrus plantations**).
Idia 1956 : No. 100 : 7–11.

Data are provided on the varietal resistance of citrus scions and rootstocks to frost in the province of Tucumán, Argentina.

849 González Sicilia, E.
Una nueva variedad de naranjas. (**A new variety of orange**).
Bol. Inst. Invest. agron., Madr. 1956 : **16** : No. 34 : 143–50.

From grafts of the variety Comuna [Common] an orange was obtained which resembled the variety Cadena [Chain] in most respects but had lower acidity and earlier maturity. On more detailed observation certain differences have been detected also in leaf form and the new variety, thought to have originated by bud mutation, is referred to as Cadena Z.

850 Pennisi, L.
Le più indicate varietà di arancio per l'industria dei succhi. (**The most suitable orange varieties for the juice industry**).
Riv. Agrumicolt. 1956 : **1** : 321–26.

Special mention is made of the variety Belladonna as having all the qualities required in the industrial preparation of orange juice.

851 Condit, I. J. & Warner, R. M.
Promising new seedling fig.
Calif. Agric. 1956 : **10** : No. 6 : 4, 14.

A productive and vigorous new fig, Conadria, has been developed by the University of California, Riverside, Calif., from a cross between Verdone ♀ and a seedling caprifig, 72–80. The quality of both the fresh and the dried fruit is very good.

852 Seki, H.
(**Cytological studies in the Moraceae IV. On polysomaty in the root-tip cells of the mulberry**).
Nihon Sanshigaku Zasshi/J. Sericult. Sci. Japan 1952 : **21** : 229–31. [Japanese].

Polysomatic cells with twice the normal chromosome complement have been observed in both diploid and triploid Japanese varieties (cf. *PBA*, XXIV, Abst. 2395).

853 Pawar, M. S., Borgaonkar, D. S. & Kulkarni, S. A.
Chromosome number of a pigmented *Annona squamosa* L.
Curr. Sci. 1956 : **25** : p. 269.

The chromosome number of a form of *Annona squamosa* which is characterized by the presence of red pigment in the stems, pericarp and mesocarp was found to be $2n = 14$, the same as the normal form. A pair of SAT-chromosomes was observed attached to the nucleolus.

854 Oppenheimer, H.
(**New mango varieties in Israel**).
Sadeh (Field)/Hassadeh 1956 : **36** : 651–54. [Hebrew].

Results of testing 47 varieties introduced from India and 11 from Florida are reported. The varieties are classified according to the colour of the ripe fruit, whether green, yellow or red. Some new varieties that have been developed from seedlings in Israel are also described. Of these Zrifin 8, Mia, 1–15, Karkur 1, Shephard and Menukha deserve notice because of their good yield and quality. The size of fruit of these varieties ranges from 200 to 700 g.

855 Matsui, S., Ito, S. & Murata, N.
(**The relation between quality and chemical composition in dried kaki fruits. I. On the relation between the various constituents and quality in a series of varieties**).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1956 : **25** : 49–53. [Japanese].

Fructose, glucose, soluble and insoluble pectin and crude fibre contents were determined in the dried fruits of a series of Japanese varieties. Sweetness depended on the total sugar content and not on the fructose/glucose ratio.

856 **New English walnut.**
Amer. Nurserym. 1956 : **103** : No. 11 : p. 74.

Adams, a new walnut originating at Salem, Ore., from introduced Manchurian material, ripens 12–14 days earlier than Franquette, is more tolerant of blight and possesses greater winter hardiness. The shells are strong and well sealed and the kernels large and well flavoured and less inclined to shrivel than those of Franquette.

857 Schad, C., Solignat, G., Grente, J. & Treil, J.
Résultats obtenus en France dans l'amélioration du châtaignier. (**Results obtained in France in chestnut breeding**).
FAO UN, Rome 1955 : FAO/CH/15-C : Pp. 21. (Mimeographed).

Work carried out in France during the past decade on breeding for graft compatibility, good rooting ability and resistance to ink disease, *Endothia parasitica*, drought and cold is reviewed briefly.

858 Elorrieta, J.
Un type intéressant de châtaignier: *C. crenata* x *C. koraiensis*. (**An interesting type of chestnut: *C. crenata* x *C. koraiensis***).
FAO UN, Rome 1955 : FAO/CH/15-E : Pp. 2. (Mimeographed).

A single individual selected at the Forestry Research Station, Madrid, from the progeny of a cross between *Castanea crenata* and *C. koraiensis* is described. At present five years old, it has a rapid growth, produces high yields of good-quality nuts and is apparently resistant to drought, ink disease and *Endothia parasitica*.

859 Urquijo Landaluze, P. & Santaolalla Azpilicueta, G.
Servicio de producción de castaños resistentes. (**Service of production of resistant chestnuts**).
Bol. Inst. Invest. agron., Madr. 1955 : **4** : 733–77.

A full description is given of the technique employed in Spain for testing for resistance to *Phytophthora cinnamomi* in F_1 and F_2 hybrids from crosses with various trees representing *Castanea mollissima* or hybrids from it and for multiplying the hybrids vegetatively. Tabular data showing the characteristics of the hybrids are presented, from which it is seen that the hybrids differ in their vigour when grafted on the local chestnut.

860 Ozols, A. & Zukovska, Z.
Perspektivās lazdu savvaļas formas Latvijas PSR. (**Promising forms of hazel from the Latvian SSR**).
Latv. PSR Zinãt. Akad. Vestis 1955 : No. 10 : 31–38.

Productive forms of hazel with nuts of good quality have been selected among wild material in the districts of Talsu, Valmiera, Bauska and Madona. Data showing the yield, size and weight of nuts and the characteristics of kernels and husks for each form are provided.

861 Zanotti, L.
La coltura del mandorlo e la dinamica delle produzioni mondiali. (**The cultivation of the almond and the dynamics of world production**).
G. Agric. Domen. 1956 : **66** : p. 305.

A brief account of Italian varieties and of introduced varieties of possible value in Italy is given. Current Italian breeding work with this crop is outlined.

862 John, C. M. & Seshadri, C. R.
A new groundnut—*Arachis hypogaea*, Linn., var. *oleifera* forma *erecta*, John et Seshadri (forma nova).
Curr. Sci. 1956 : **25** : 233–34.

An erect form given the above designation is described. Isolated in 1936 from a cross of Spanish 10, a bunch type, with HG1, a semispreading type, it is a double recessive for the bunch and semispreading habits.

863 Higgins, B. B. & Bailey, W. K.
New varieties and selected strains of peanuts.
Bull. Ga. Exp. Sta. 1955 : No. N.S.11 : Pp. 35.

Illustrated descriptions of the following six varieties recently released in Georgia are presented: GFA Spanish was developed by line selection from Small Spanish, which it outyields by about 5%; Dixie Spanish (cf. *PBA*, XXII, Abst. 2981); Southeastern Runner 56–15 is a high-yielding line of Southeastern Runner; Virginia Bunch 67 is a high-yielding variety of uncertain origin with a somewhat spreading bunch habit, medium-thin shells and seeds similar in size to those of Southeastern Runner types; Virginia Bunch G2, a line selection from Virginia Bunch G, has large seeds and resembles Virginia Bunch 67 in habit; Virginia Runner G26, selected from a mixed sample of high-yielding seed, has large pods, large seeds and a prostrate habit; and Georgia 119–20, developed from crosses of Southeastern Runner with large-seeded strains of Virginia Runner, is adapted to Georgia conditions, has surpassed Small Spanish in yield of pods by 75%, bears large attractive pods and shows vigorous plant growth. A promising unreleased hybrid, 207–3, is unsuitable for the edible groundnut trade but has a high oil content of 52–56% on an oven-dry basis. A number of other promising strains are undergoing tests.

864 Seshadri, C. R. & Seshu, K. A.
A mutant form of groundnut.
Madras agric. J. 1956 : **43** : 199–200.

A dwarf variant with abnormally large leaves has been observed at the Coimbatore Central Farm in the semierect line AH6615 derived from Spanish Bombay x Native Tanganyika.

865 Ramakrishnan, T. S. & Seethalakshmi, V.
Studies in the genus Phytophthora. III. Homothallic strains of Phytophthora on *Areca catechu*.
Proc. Indian Acad. Sci. 1956 : **43** : 308–13.

Of the isolates of *Ph. palmivora* studied, three proved to be homothallic and two heterothallic.

866 **Annual Report of the Coconut Research Board of the Coconut Research Institute for 1954** (1956) : Pp. 57.

A technique found satisfactory for the pollination of the *typica* palm is described. The inflorescence is emasculated and bagged 17 days after the opening of the spathe, the ♀ flowers being thinned out to about 20. The stigmas usually attain receptivity 22–24 days after the spathe opens. Pollen may be stored over 43·4% sulphuric acid in a desiccator at room temperature.

High-yielding mother palms were pollinated to provide material for selecting seedlings suitable for a seed garden.

Of the intervarietal hybrids so far obtained, the F_1 of Dwarf (green) ♀ x *typica* ♂ appears the most promising, being vigorous and early maturing. In these two forms and other palms used as parents, viz. Dwarf (red), Dwarf (yellow), Kingcoconut and San Ramon, $2n = 32$. The F_1 hybrids of Kingcoconut x Dwarf (green) bear small nuts and are poor in copra quality; they are however suitable for growing in domestic gardens for beverage purposes.

867 Satyabalan, K.
Hybridization in coconut improvement.
Bull. Indian cent. Coconut Comm. 1956 : **9** : 233–34.

A short popular account is given of breeding at the Central Coconut Research Station, Kasaragod, South Kanara, where crossing has been effected between tall and dwarf types of local and foreign origin with the chief aim of obtaining varieties combining high yield, early maturity, the production of high-quality copra and high oil content.

868 Davis, T. A., Anandan, A. P. & Menon, K. P. V.
An instance of dimorphic sex expression and compound spadices in a coconut palm.
Indian Cocon. J. 1955 : **8** : 150–57.

The palm described produces large inflorescences containing only ♂ flowers for part of the year but androgynous spadices for the remainder. It is thought to be in a transitional stage from a monecious to a diecious condition.

869 Liyanage, D. V.
Intra-specific hybrids in coconuts. I. Preliminary report on crosses between *typica* and *nana* varieties.
Bull. Cocon. Res. Inst. Ceylon 1956 : No. 7 : Pp. 16.

The performance of hybrids between the *Cocos nucifera* varieties *typica* and *nana* during their first five years of growth in Ceylon is described. Hybrids of *typica* ♀ x *nana* ♂ produced more leaves than either parent and resembled the *typica* form in stem girth, in having protandrous inflorescences, in the continuous rather than periodical production of inflorescences and in size and quality of nuts; flowering occurred at an earlier age than in *typica* but later than in *nana*. The few reciprocal hybrids studied had similar characters but flowered later although they, too, were earlier than *typica*; the seedlings were distinguished by their marked vigour.

Two male-sterile *typica* types are known, one in which the female inflorescence is unbranched and one in which it is branched but has relatively short spikelets. The latter type is being crossed with *nana*.

870 Jacob, K. C.
A new variety of coconut palm.
Indian Cocon. J. 1955 : **8** : 92–93.

Designated *Cocos nucifera* var. *spicata*, the new variety here described is characterized by having an unbranched inflorescence. Owing to the spike-like nature of the inflorescence there is not enough room for the development of a large number of nuts but the variety produces female flowers in profusion and it is thought that this character may prove of value to the breeder in hybridization.

871 Sayeed, P. M.
Some observations on the shedding of buttons in the coconut.
Indian Cocon. J. 1955 : **8** : 49–57.

Premature shedding of the ♀ flowers either before or after pollination is discussed and differences in the susceptibility of a number of varieties to this defect are noted.

872 Boccanera, G.
Ricerche su l'autofertilità e l'autosterilità delle principali varietà d'olivo coltivate nell'agro Spoletino e risultati di alcune prove d'impollinazione artificiale. (**Research on the self fertility and self sterility of the principal olive varieties cultivated in the Spoleto district and results of some artificial pollination tests**).
Ann. Sper. agr. 1956 : **10** : 1281–98.

The observations reported show the varieties Moraiolo, Raja and Ascolana to be self sterile whilst an unidentified variety related to Correggiolo proved self fertile. From the results of interpollination between a number of varieties some recommendations are given as to the best pollinators for the three self-sterile varieties.

873 Di Prima, S.
Riconferma della validità del metodo bio-statistico nella descrizione e classificazione varietale dell'olivo. (**A reconfirmation of the validity of the bio-statistical method in the description and classification of olive varieties**).
Ann. Sper. agr. 1956 : **10** : 1143–49.

In referring to criticisms that have been made of his method of classification the author gives certain clarifications as to the nature and use of his varietal index and shows that according to the figures published by Baldini and Scaramuzzi (cf. *PBA*, XXVI, Abst. 2801) the variation within varieties was distinctly less than that between varieties.

874 Hall, J. W.
Scottish fruit trials. Second progress report—Part I—(raspberries).
Scot. Agric. 1956 : **36** : 23–26.

The results of trials held at Mylnefield, Craibstone, Auchincruive and Liberton in 1953–55 are presented. Yields, quality and length of picking season varied according to variety, locality and year, but Lloyd George gave the highest average yield, Malling Jewel and Lloyd George proved most suitable for quick-freezing and canning and Norfolk Giant yielded the best jam. At Auchincruive, Lloyd George showed the lowest incidence of *Didymella applanata.*

875 BOLL, H. L. & COLBY, A. S.
Crimson Cone, a new raspberry variety.
Fruit Var. hort. Dig. 1955 : **10** : p. 44.

Developed from Latham x Milton at the Illinois Agricultural Experiment Station, Crimson Cone is a summer-bearing variety highly resistant to winter killing. Its medium to large fruits are free from crumbling and in picking separate from the receptacle. (Cf. Abst. 876).

876 **Crimson Cone raspberry.**
Amer. Nurserym. 1956 : **103** : No. 11 : p. 70.

Crimson Cone is a new summer-bearing raspberry developed at the University of Illinois from Latham x Milton. The plants are tall, vigorous and hardy, with many prickles, produce numerous suckers and give high yields of attractive firm fruits, excellent in flavour and easily picked. (Cf. Abst. 875).

877 FERNQVIST, I.
Sortförsök med hallon i Norrland. **(Varietal trials of raspberries in Norrland).**
Medd. Trädgårdsförs. 1956 : No. 99 : Pp. 25.

Of ten varieties tested at six localities in Norrland, Sweden, Asker, Marlborough, Miranda and Hornet were the hardiest and the least infected by virus and were among the highest-yielding varieties.

878 TARANOVA, E. A. & KIECE, V. T.
(Pollination and the yield of black currants).
Latv. PSR Zinãt. Akad. Vestis 1955 : No. 12 : 91–98. [Russian].

At the Pūre Research Station the yield and fertility of Lija Plodorodnaja [Prolific Lia], Boskoop Giant, Neapolitan and Goliath, (1) self pollinated or (2) fertilized by large or small amounts of pollen of another variety, were investigated. Good pollinators for each variety are listed.

879 DARROW, G. M.
The big six blueberry varieties for Northern States.
Nat. hort. Mag. 1956 : **35** : 162–65.

The varieties Earliblue, Blueray, Bluecrop, Berkeley, Herbert and Coville, recommended as substitutes for the other varieties grown in the northern region of the USA, are briefly described.

880 DARROW, G. M.
Effect of temperature and day length on varietal adaptation of strawberry.
Fruit Var. hort. Dig. 1955 : **10** : 37–40, 51–54.

Flower-bud formation and fruit production of varieties grown in the western hemisphere and in Europe are discussed with reference to temperature and day length; the behaviour of everbearing species is also outlined. Suggestions are made concerning ways of improving production in the USA by developing varieties with extended fruiting seasons, the possible value of *F. ovalis*, *F. chiloensis*, *F. virginiana* and some European varieties being pointed out.

881 GOHEEN, A. C., MCGREW, J. R. & SMITH, J. B.
Tolerance of strawberry plants to hot-water therapy.
Plant Dis. Reptr. 1956 : **40** : 446–51.

Data are given on the tolerance of 56 varieties towards the hot-water treatment used in controlling virus and other diseases. Most varieties equalled or surpassed Blakemore in tolerance.

882 MEĻECHINA, A.
Zemeņu selekcija Latvijas PSR. **(Strawberry breeding in the Latvian SSR).**
Latv. PSR Zinãt. Akad. Vestis 1955 : No. 10 : 39–42.

This report on breeding work on strawberries at the Pūre Research Station mentions the new high yielding hybrids 1904 (Aelita x Rīga Jūrmalas), 1512 (Krasnyĭ Slon [Red Elephant] x Roščinās and 874 (Roščinās x Rīga Jūrmalas). They are notable for high quality of the fruit and 1904 and 1512 are hardy. The latter also shows resistance to fungi.

883 BELL, H. K.
Howard 17 and Premier strawberry —are they one and the same ?
Fruit Var. hort. Dig. 1955 : **10** : 57–58.

Howard 17 and Premier have for many years been regarded as synonymous but at present uncertainty exists in Michigan concerning the nomenclature of virus-free stocks since such stocks have differed from the regular commercial ones. Possibly Howard 17 and Premier represent two genetically different but closely similar varieties, or alternatively they may in fact be synonymous and a separate strain may have arisen by mutation or as a chance seedling.

884 Nürberg-Krüger, U.
Die Beeinflussung des Geschlechts bei zwittrigen Fragaria-Arten durch Bastardierung. **(Influencing the sex of diecious Fragaria species by hybridization).**
Ber. dtsch. bot. Ges. 1955 : **68** : Generalversammlungs-Heft : p. 16.

The hybrid *F. vesca* x *F. nilgerrensis* gave hybrids in which the pollen was almost completely sterile. When the hybrid was back crossed to *F. vesca* the pollen fertility varied between the values for the parents and the F_1, whereas in the back cross with *F. nilgerrensis* the values were between 0 and that of the F_1 and the anther numbers were also much reduced. The cause of the sterility was due not to a discordance between the two genomes or meiotic irregularities but to a failure of the *nilgerrensis* genome to function in *vesca* cytoplasm.

885 Štefka, F.
Zhodnovení výsledků individuální selekce révy vinné. **(An evaluation of the results of individual selection of vines).**
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1956 : **29** : 653–78.

At Velké Pavlovice, 60–70% of the varieties were unproductive and it is shown that the yield of each variety can be greatly improved by selection. For instance, by selecting clones of Veltlínské Zelené [Green Veltlínské], Neuburg and Frankovka producing upwards of 1 kg. of grapes, a 100% yield increase was obtained. By selecting clones of Ryslink Rynské [Rhein Riesling] producing more than 0·75 kg. and Ryslink Vlašske [Italian Riesling] more than 0·80 kg., the increases were estimated at 50% and 95% respectively. For Tramín Červené [Red Traminer] and Sylvánské Zelené [Green Sylvaner] selections producing upwards of 0·70 kg. the improvement in yield was estimated at 40%.

886 Jusupov, H. S.
(Results of research during the first decade).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. 3 : 59–61. [Russian].

Breeding work on vines at the Central Asiatic Branch of the USSR Institute of Viticulture during the period of 1945–55 is discussed. Among the achievements are hybrids of VIR 1 [Institute of Plant Industry 1] with Hindogny and Saperavi. These are characterized by intensely coloured juice and make attractively coloured dessert wines of a distinctive flavour.

887 Barrett, H. C.
The French hybrid grapes.
Nat. hort. Mag. 1956 : **35** : 132–44.

An account of the origin and characteristics of French hybrid varieties is given, together with descriptions of the hybrids considered to be the most promising for cultivation in the USA.

888 Seyve-Villard.
Les hybrides. **(Hybrids).**
Progr. agric. vitic. 1956 : **73** : 295–301.

In reply to Grassé (cf. Abst. 899), it is pointed out that many interspecific hybrids produce excellent wines besides being highly productive and resistant to mildew and *Phylloxera* and that improved hybrids are being developed continually.

889 Ceccarelli, G.
Vitigni che vanno scomparendo: lo Zagarese. **(Vines that are disappearing. Zagarese).**
Riv. Vitic. 1955 : **8** : 21–30.

The vine Zagarese, which is described, produces a dessert wine of high quality but its yield is low on account of imperfect set, a defect which, it is suggested, could be remedied by selection for fertility.

890 Pirovano, A.
Il moscato dell'Adda. **(The Adda muscat).**
Riv. Vitic. 1955 : **8** : 147–48.

The vine described is a natural hybrid from Hamburg Muscat, produced some seventy years ago; it is described as an excellent black grape suitable for export.

891 Cosmo, I. & Polsinelli, M.
"Molinara".
Ann. Sper. agr. 1956 : **10** : No. **4** : Suppl. : cxv–cxxvii.

This grape variety, which is described, provides one of the constituents of the well known Verona wines.

892 Bruni, B.
"Pascale di Cagliari".
Ann. Sper. agr. 1956 : **10** : No. **4** : Suppl. : cxxix–cxxxv.

The vine described is the most popular dessert variety in Sardinia, where it is also used for wine.

893 VIVONA, A.
La "Cardinal" nuova uva precoce da mensa. (**Cardinal, a new early dessert grape**).
Ital. agric. 1956 : **93** : 495–502.

A description is given of this American variety which in Italy matures between Reine des Vignobles [Queen of the Vineyards] and Chasselas doré [Golden Chasselas] and is more regular in yield than other early varieties.

894 LELAKIS, P.
Sur une méthode de contrôle rapide du succès de l'induction de la polyploidie chez les plantes ligneuses. (**On a rapid method of checking the success of the induction of polyploidy in woody plants**).
Progr. agric. vitic. 1956 : **73** : 27–28.

The following method of confirming the occurrence of induced polyploidy has been used successfully in the vine. The growth of colchicine-treated buds is accelerated by removing the leaves and watering the plant with a nutrient solution. Branches from the treated buds showing morphological features characteristic of the polyploid condition are then cut into pieces 3 cm. long and cultured in an agar medium containing naphthylacetic acid. After ten days the roots are 2–3 mm. long and their chromosomes may be counted.

895 AVRAMOV, L.
(**A study of pollination and fertilization in the more important indigenous and some foreign vine varieties**).
Zborn. Rad. poljoprivred. Fak./Rev. Res. Wk. Fac. Agric., Beograd 1955 : **3** : No. 2 : 83–90. [Serbian].

Perfect-flowered varieties from northern Serbia, such as Prokupac, are protandrous but tend to self pollinate. Instances of cleistogamy were observed though these were rare. Some other varieties bear male-sterile hermaphrodite flowers and require foreign pollen for their fertilization.

896 BRIZA, K.
(**Firmness of berries of the commoner dessert varieties of vines**).
Zborn. Rad. poljoprivred. Fak./Rev. Res. Wk. Fac. Agric., Beograd 1955 : **3** : No. 2 : 75–82. [Serbian].

Indices of firmness, measured in g. per mm.^{2} for the varieties Afuz-Ali, Hamburg Muscat, Chasselas Red and Čabski Biser [Csaba Pearl] are given. Chasselas Red, with 5·25 g./mm.^{2} showed the highest degree of firmness.

897 COSMO, I., COMUZZI, A. & RUBIN, V.
Indagini sulla ricostituzione viticola delle Venezie ai fini dell'orientamento per i futuri impianti. Risultati della sperimentazione compiuta sui vitigni Europei da vino e sui portinnesti in provincia di Padova a decorrere dal 1926. Quarto contributo. Zona dei Colli Euganei: sottozona dei terreni poco o niente clorosanti. (**Investigations on the viticultural reconstruction of the Venetian provinces with the object of providing guidance for future planting. Results of experiments carried out on European wine grapes and on rootstocks in the province of Padua from 1926 onwards. IV. Colli Euganei zone. Subzone producing little or no chlorosis**).
Ann. Sper. agr. 1956 : **10** : 1263–79.

In the vineyards reported on in this contribution (cf. *PBA*, XXVI, Abst. 3786), which were on soils relatively low in calcium, the best results were obtained from Kober as a rootstock.

898 CASARINI, B.
L'attacco peronosporico nelle prime fasi di vegetazione della vite. (**Infection by *Plasmopara viticola* in the first phases of flushing of the vine**).
Ital. agric. 1956 : **93** : 601–06.

Most varieties are believed to become susceptible to *P. viticola* only after the leaves have attained a superficial area of some 6–8 cm^2. The variety Panse precoce [Early Panse] appears to become susceptible immediately after the opening of the buds.

899 GRASSÉ, M.
La crise viticole vue sous l'angle de la recherche scientifique. (**The viticultural crisis from the point of view of scientific research**).
Progr. agric. vitic. 1956 : **73** : 121–27.

With the aim of improving French wines, the quality of which is regarded as having deteriorated through the increasing use of *Phylloxera*-resistant interspecific hybrids, it is urged that local *Vitis vinifera* varieties be evaluated for resistance to *Phylloxera* and fungous diseases, that the inheritance of resistance be studied and that the factors for resistance be introduced into the best wine varieties.

FORESTRY

900 Basse, N.
Årsberetning 1955–56. (**Annual report, 1955-56**).
Hedeselsk. Tidsskr., Aarhus 1956 : **77** : 133–70.

The activities of the Danish Heath Society have included the collection of cuttings from selections of various pine species, Japanese larch, spruce and other trees for use in breeding and in the establishment of seed plantations. Seed was collected from the selected trees with a view to studying individual progenies.

901 Schönbach, H.
Forstpflanzenzüchtung und waldbauliche Entwicklung. (**Forest tree breeding and sylvicultural development**).
SB dtsch. Akad. LandwWiss. Berl. 1955 : **4** : No. 13 : 25–31.

The importance of replanting forests with seed of genotypes adapted to the particular environment in which they are to grow is stressed. Intensive felling of whole forests in Germany during the past 150 years has resulted in the loss of much valuable genetical material and, in addition, considerable areas have been replanted with unsuitable seed. The author recommends that such areas should be felled as soon as it is economically possible to do so and that, in future, a form of negative mass selection based on felling all but a few outstanding trees should be practised, seed from these élite trees then being used for reafforestation purposes.

902 Tucker, J. M. & Muller, C. H.
The geographic history of *Quercus ajoensis*.
Evolution, NY 1956 : **10** : 157–75.

The ecology and geographical distribution of *Q. ajoensis* in Arizona, paleobotanical evidence and the biometric analysis of populations of this species and *Q. turbinella* and their hybrids lead the authors to suggest that *Q. ajoensis* has several times become relictual in the western region of the USA (cf. *PBA*, XXIV, Abst. 3375).

903 Kriebel, H. B.
Drought-hardy strains extend planting of sugar maple.
Ohio Fm. Home Res. 1956 : **41** : 35, 38.

Tests of sugar maples from various parts of Ohio and from other states showed some races to be more drought resistant than others under conditions at the Ohio Agricultural Experiment Station. The most resistant originated from southern Illinois and the deep South but are not suitable for timber; trees from south-western Ohio are almost as drought resistant and have better form.

904 Mišić, V.
Ancestralne pojave na listu balkanske bukve (*Fagus moesiaca* Czecz.) u Jugoslaviji. [**Ancestral manifestations in the leaves of the Balkan beech (*F. moesiaca*) in Jugoslavia**].
Arh. biol. Nauk. (Arch. biol. Sci.) Arch. Sci. biol., Beograd 1955 : **7** : 115–20.

Jugoslav beech samples with dentate leaves and cordate leaf bases are described. These features are characteristic of Tertiary beeches.

905 Mišić, V.
(**Principles and methods for investigating the systematics of the beech in Jugoslavia**).
Zborn. Rad. Inst. Ekol. Biogeogr. (Rep. Wk. Inst. Ecol. Biogeogr.)/Rec. Trav. Inst. Écol. Biogéogr.), Beograd 1955 : **6** : 1–14. [Serbian].

The range of variation in Jugoslav beeches is described on the basis of a biometrical study of the leaves and cupules. It is concluded that only one species is involved but that ecotypic differentiation has occurred within it.

906 Vabre-Durrieu, A.
Structure nucléaire quiescente chez quelques Abiétacées. (**Structure of the resting nucleus in some Abietaceae**).
CR Acad. Sci., Paris 1956 : **242** : 1811–13.

Cytological studies of the resting nuclei of a number of genera pertaining to the Abietaceae provided supporting evidence for the hypothesis that *Cedrus* and *Abies* belong to one phylum, *Larix* and *Pseudotsuga* to another and that *Picea* and *Tsuga* are to be regarded as distinct phyla. All the above genera are thought to have evolved from the ancestral form of the genus *Pinus*.

907 Callaham, R. Z.
Needle oils of three pine species and species hybrids.
For. Sci. 1956 : **2** : 101–05.

Pinus ponderosa, *P. jeffreyi*, *P. coulteri*, F_1 *P. jeffreyi* x *P. ponderosa*, the back cross of a natural *P. jeffreyi* x *P. coulteri* hybrid to *P. jeffreyi*, and the wind-pollinated progeny of this natural hybrid showed no marked differences in the physical properties of their needle oils. Further investigations are required to determine whether reaction to weevil (*Cylindrocopturus eatoni*) depends upon the constituents of the oils. The physical properties of the needle oil of *P. jeffreyi* x *P. ponderosa* were intermediate between those of the parental species; most of the properties of the *P. jeffreyi* x *P. coulteri* hybrids transgressed the parental values. The properties of needle oils do not appear to be as useful in the study of interspecific hybridization as those of the oleoresin turpentines.

908 Reines, M. & Green, J. T.
A syringe for pine pollination.
J. For. 1956 : **54** : p. 598.

A 30 cc. polyethylene syringe suitable for use in pollinating pine is described. Its chief advantage is that it is less breakable than glass, thus reducing the possibility of losing valuable pollen.

909 Wakeley, P. C. & Campbell, T. E.
Some new pine pollination techniques.
Occ. Pap. Sth. For. Exp. Sta. 1954 : No. 136 : Pp. 13.

This paper describes briefly the floral biology of the pine and outlines several new pollination techniques, including the use of synthetic sausage-casing bags, disposable pollen extractors and plastic hypodermic syringes, devised at the A. J. Hodges Industries Experimental Area, near Many, La.

910 Mirov, N. T.
Composition of turpentine of lodgepole x jack pine hybrids.
Canad. J. Bot. 1956 : **34** : 443–57.

Turpentine from *Pinus contorta* consisted largely of the monocyclic terpene l-β-phellandrene with varying amounts of dextrorotatory sesquiterpene compounds, that from *P. banksiana* consisted predominantly of a mixture of the bicyclic terpenes d- and l-α-pinene with varying amounts of l-β-pinene and that from the artificial F_1 hybrid *P. contorta* x *P. banksiana* contained 20–22% of l-β-phellandrene and 75–78% of pinenes. Trees from a hybrid swarm in Alberta also tended to have a higher proportion of bicyclic than of monocyclic terpenes, but the chemical composition of the turpentine did not always correspond with the morphological characters of the tree.

VEGETABLES

911 Vilmorin, R. L. de
Masters memorial lecture, 1956. The improvement of strains of vegetables.
J. R. hort. Soc. 1956 : **81** : 338–46; 386–95.

An outline of the history of vegetable improvement in general and a short explanation of classical methods of breeding are followed by an account of modern methods such as F_1-hybrid production and polyploidization.

912 Hahn, P.
Neue Gemüsesorten, die 1955 in die Sortenliste aufgenommen und für den Anbau zugelassen wurden. (**New vegetable varieties which were admitted to the variety list in 1955 and approved for cultivation**).
Dtsch. Gartenbau, Berlin 1956 : **3** : 125–27.

Brussels sprouts. Erfurter Auslese [Erfurt Selection], a selection from Fest und Viel [Firm and Many], is a high-yielding, frost-resistant variety suitable for picking in January. It gives higher yields than its parent variety and the sprouts keep well when picked.

Lettuce. Presto, an early-maturing lettuce suitable for forcing, was developed at the Quedlinburg Plant Breeding Institute, Eastern Germany. It resembles Böttners Treib [Böttner's Forcing] but produces heavier heads and has leaves of a darker green than the latter variety and is also less susceptible to bolting. The heads are of excellent quality and mature a few days later than those of Böttners Treib. Gigant [Giant] and Brauner Sommer [Brown Summer] are both midlate, outdoor varieties from the Quedlinburg Plant Breeding Institute. Gigant is characterized by its large, firm heads and resistance to bolting and Brauner Sommer by the reddish-brown colouring of its outer leaves and by its resistance to virus diseases.

Melon. Leckerbissen [Tasty Morsel] is an early-maturing melon producing heavy yields of medium-sized fruits with flesh of a bright orange colour. The fruits have a high content of sugars and a pleasant aroma and contain few seeds.

Tomato. Perfekta is an early-maturing, outdoor variety of bush tomato giving high yields of large round fruits of good quality and moderately resistant to cracking.

French bean. Selecta and Sonnengold [Sun Gold], both from the Quedlinburg Institute, give high yields of good-quality beans, grow vigorously and display a marked degree of resistance to most common bean diseases.

Peas. Maiwunder [May Wonder] and Konservenperle II [Conserve Pearl II] are two new varieties of marrow-fats from Quedlinburg. Maiwunder matures earlier than all other marrow-fats at present grown in Germany and gives high yields of good-quality peas suitable for preserving. Konservenperle II is a selection from Konservenperle, which it excels in quality and yield. A midlate variety, it produces peas eminently suitable for bottling and canning.

913 Karner, L.
Ergebnisse der Gemüsesortenversuche des Jahres 1955. (**Results of vegetable trials during the year 1955**).
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1955 : No. 31 : Pp. 47.

Tabulated data on the results of variety trials conducted at Gumpenstein and at other centres in Styria and Carinthia, in the Tyrol and in the Salzburg area are presented. Among the crops tested were beetroot, kohl rabi, sweet pepper, carrots, radish, pepper, cabbage, cauliflower, lettuce, peas and beans.

914 Thiessen, E. J.
Vegetable varieties and high-altitude freezing.
Bull. Wyo. agric. Exp. Sta. 1955 : No. 335 : Pp. 34.

Recommendations are given regarding the suitability of varieties of peas, snap beans, broccoli, cauliflower, spinach, chard, carrots and sweet corn for cultivation at an altitude of 7200 ft. and for preservation by freezing.

915 Jones, H. A. & Sleesman, J. P.
Onion hybrids.
Ohio Fm. Home Res. 1956 : **41** : 60–62.

Recently developed hybrids include Aristocrat, Bonanza, Elite, Epoch and Surprise for long storage, and Abundance, Champion, Contender and Encore for short storage periods. Experimental techniques used in the development of new hybrids are described.

916 Jones, H. A.
Hybrid vegetables of tomorrow.
Seed World 1956 : **79** : No. **3** : p. 35.

Among the hybrids produced since male-sterile onion lines were released in 1944 by the USDA are Abundance, Aristocrat, Bonanza, Champion, Contender, Elite, Encore, Epoch and Surprise, all of which were mentioned in *PBA*, XXVI, Abst. 1070. Further varieties are Pioneer, a long-storage type with hard flesh and adhering scales, suitable for mechanical harvesting, Fiesta, a Sweet Spanish type adapted to south western Idaho and eastern Oregon, and Early Harvest, a hybrid with rapid early growth.

917 Jones, H. A.
Hybrid vegetables of tomorrow.
Seed World 1956 : **79** : No. **4** : p. 14.

The history of hybrid onion breeding in Texas since 1939, when the production of inbreds was first undertaken, is outlined. A new white hybrid, White Granex, is to be released shortly by the US Department of Agriculture in cooperation with the Texas Agricultural Experiment Station. Current work is chiefly concerned with incorporating pink-root resistance into hybrid material.

918 Hattersley-Smith, M. K.
***Allium neapolitanum*: a mixed species.**
Nature, Lond. 1956 : **178** : p. 272.

In one commercial sample from Holland the chromosome number was diploid ($2n = 14$); another sample contained types with $2n = 21$, 28 and 35. An interesting feature observed in one small chromosome of the triploid and occasionally of the tetraploid was a pronounced attenuation of the centromere.

919 Weinmann, I.
Untersuchungen zur Samendiagnostik von *Brassica*-Arten und -Sorten unter besonderer Berücksichtigung chemisch-physikalischer Methoden. (**Studies on the diagnosis of the seeds of *Brassica* species and varieties with special reference to chemical-physical methods**).
Z. Pflanzenz. 1956 : **36** : 1–30.

The problem of seed identification in *Brassica* spp. is discussed and ways of distinguishing between the different species by a study of the morphological characteristics of the seeds and seedlings and, in the laboratory, by the identification of the pigments present in the seeds are explained. Varieties within a species may usually be distinguished by means of paper chromatography, which indicates differences in the amounts of methanol-soluble pigments present, especially those belonging to the flavone group. The chemical analysis of flavonoid derivatives is also of value and the proportion of monosaccharides and disaccharides to total content of sugars frequently provides a useful guide in varietal identification.

920 Crocomo, O. J. & Salibe, A. A.
Conteúdo em cálcio, proteina e vitamina C em doze variedades de couve (*Brassica oleracea*). [**Content of calcium, protein and vitamin C in twelve varieties of cabbage (*B. oleracea*)**].
Rev. Agric., Piracicaba 1956 : **31** : 113–28.

After a review of appropriate literature indicating the importance of calcium as a nutritional element a report is given of analyses which showed that the popular varieties known as Couve manteiga legitima [True Butter Cabbage] and Couve S. Paulo had the highest Ca contents, with 1·925 and 1·875% respectively; the variation in Ca content was not however great, the lowest value in the twelve varieties being 1·350%.

921 Simard, J.
Essais répressifs contre la jaunisse du chou. (Trials to repress cabbage yellows).
36 Rep. Quebec Soc. Prot. Pl. 1954 (1956) : 93–94.

Varietal differences in susceptibility to *Fusarium oxysporum* f. *conglutinans* were observed in trials carried out by the Agricultural Advisory and Research Service, Montreal, Canada. Marion Market and Resistant Detroit were the most resistant and in these varieties resistance was governed by a single gene. The resistance of Wisconsin Hollander appeared to depend upon several factors and this variety was more susceptible than either Marion Market or Resistant Detroit at moderately high temperatures.

922 Natti, J. J.
Influence of cauliflower mosaic and turnip mosaic viruses on yields of cabbage in New York State.
Plant Dis. Reptr. 1956 : **40** : 591–95.

A series of cabbage varieties were tested for yield (*a*) when infected with a mixed inoculum of the above two viruses, and (*b*) when virus-free. The difference in yield under conditions (*a*) and (*b*) shown by Wisconsin mosaic-resistant Danish was less than that in all the other varieties tested.

923 Garcia, G. M.
A preliminary study of the production of cauliflower seed.
Philipp. J. Agric. 1954 (1956) : **19** : 143–52.

Attempts were made to produce seed at Ilocos Norte, using the varieties Early Patna and Early Market. A new local strain with early-maturing seed was isolated from Early Patna and given the name Ilocos Early Patna. Many plants of the varieties investigated failed to set seed.

924 Thomas, W. O.
Report on truck crops suitable for quick freezing.
Miss. Fm. Res. 1956 : **19** : No. **3** : p. 6.

In trials of six broccoli varieties, Texas 107 and Green Mountain gave good yields, and Waltman No. 29 gave a poor yield.

925 McFerran, J.
Plot technique studies with spinach.
Diss. Abstr. 1956 : **16** : Publ. No. 15,518 : p. 194.

From a uniformity trial of spinach with a basic plot 2′ long x 3½′ wide, the optimum plot size was calculated by Smith's formula to be 1·26 basic-plot units. Incomplete block designs gave small gains in efficiency over randomized blocks.

926 Katayama, Y. & Shida, S.
(The development and location of intersexual flowers in spinach).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 19–22. [Japanese].

A description is given of the different types of intersexual flowers that occur in spinach and of the various modes of distribution of these flowers in the inflorescence. A table summarizing the incidence of intersexuality in selfed seed from intersexual plants is also given (cf. *PBA*, XXV, Abst. 2459).

927 Smith, P. G. & Zahara, M. B.
New spinach immune to mildew.
Calif. Agric. 1956 : **10** : No. 7 : p. 15.

The downy-mildew immune variety Califlay was developed by crossing Viroflay, the chief commercial variety in California, with the wild Iranian introduction PI140467 and by back crossing four times to Viroflay. The downy-mildew immunity of the introduction depends upon a single dominant gene. Califlay is intended for use in areas where Viroflay is adapted; it shows only minor differences from the parental variety which it has equalled in yield in California. Elsewhere in the USA and in the Netherlands, Califlay has also remained free from downy mildew.

928 Whitaker, T. W.
The origin of the cultivated Cucurbita.
Amer. Nat. 1956 : **90** : 171–76.

The cultivated species *C. pepo*, *C. mixta*, *C. moschata*, *C. ficifolia* and *C. maxima* are for the most part incompatible when intercrossed; they have apparently developed physiological barriers of sterility that effectively prevent gene exchange between them. The five species have however been found to be cross compatible with the wild species *C. lundelliana* from southern Mexico and adjacent regions in Central America. Matings of *C. lundelliana* with *C. moschata*, *C. maxima* and *C. ficifolia* produced self-fertile F_1 plants which were cross fertile with either parent and highly regular meiotically. Crosses of the wild species with the other two cultivated species resulted in fruits, but the seeds had small embryos; special techniques will be required to raise F_1 hybrids from these combinations. The data on interspecific hybridization and geographical distribution suggest that *C. lundelliana* may have played an important role in the origin of the group of cultivated species.

929 MILLER, L. A.
Insecticides and varietal resistance in the control of the squash vine borer, *Melittia cucurbitae* (Harr.), in southwestern Ontario.
Canad. J. agric. Sci. 1956 : **36** : 309–13.

In tests of varieties of nine species of cucurbits, the following proved immune from borer attack: *Cucurbita moschata* 'Butternut', *Cucumis melo* 'Iroquois', *Citrullus vulgaris* 'Honey Cream', *Cucumis sativus* 'National Pickling' and 'Straight 8' and unspecified material of *Lagenaria siceraria* and *Citrullus vulgaris* var. *citroides*.

Varieties of *Cucurbita maxima*, *Cucurbita pepo* and *Lagenaria vulgaris* were all susceptible.

930 IVANOFF, S. S.
New cantaloupe released: developed by experiment station for home gardens.
Miss. Fm. Res. 1956 : **19** : No. 1 : 1, 7.

A selection from Smith's Perfect x California 5, named Homegarden, is recommended. In trials with other varieties it gave a higher yield per acre, and equal or greater sugar content per weight of fruit. The flavour is good. It shows moderate resistance to *Pseudoperonospora cubensis*, *Erysiphe cichoracearum* and *Diaphania* spp., and high resistance to aphids.

931 WAGNER, M.
Pěstování krmných tykví. (**Growing gourds for forage**).
Za socialist. Zeměd. 1956 : **6** : 918–22.

In the trials conducted by the Forage Research Institute at Brno, Stofuntovaja [Hundred Pounds] outyielded all other gourd varieties under various climatic and soil conditions.

932 WALL, J. R.
Interspecific hybridization in *Phaseolus* and in *Cucurbita* I. Gametic diversity as an aid to interspecific hybridization in *Phaseolus* and in *Cucurbita*. II. Recombination in species crosses in *Phaseolus* and in *Cucurbita*.
Diss. Abstr. 1956 : **16** : Publ. No. 15,609 : p. 436.

The hypothesis that highly heterozygous plants are more likely to yield viable embryos in interspecific crosses than are relatively homozygous parents was put to the test by a study of *Ph. vulgaris* x *Ph. coccineus* and *C. pepo* x *C. moschata*, using intervarietal F_1 hybrids and "pure" varieties as parents. In general, the most favourable cross of the type intervarietal hybrid x variety was only slightly superior to the best variety x variety combination. In *Cucurbita*, by far the highest number of viable embryos was obtained by crossing intervarietal hybrids of both species.

Cotyledon position in *Phaseolus* depended upon multiple factors. Shifts in the frequency distribution for cotyledon position towards the *Ph. vulgaris* parent in the F_2–F_4 were attributed to gametic and zygotic elimination of genes of *Ph. coccineus*. Significant negative correlations between seed yields and morphological characters in the F_2 and F_3 suggested that increased fertility was achieved through elimination of *Ph. coccineus* genes. It is therefore concluded that horticulturally desirable recombinations would be difficult to obtain. Relatively frequent recombination was however expressed in the F_2 of *C. pepo* x *C. moschata*, partial dominance of the characteristics of *C. pepo* being noted. Pollen abortion in the F_2 was not correlated with morphological features; this observation was interpreted as indicating that the more parent-like plants were no more fertile than the more extreme recombination phenotypes.

933 EDWARDS, G. R.
The butternut pumpkin.
J. Dep. Agric. S. Aust. 1956 : **59** : 466–67.

The variety Butternut, which has recently been introduced into southern Australia from the USA, is described as an early-maturing variety producing small fruits with a bulbous body and a very thick neck. The flesh has a smooth, nutty flavour and is of excellent cooking quality. The small, bush-like growth of this variety makes it suitable for interplanting between the trees of young orchards.

934 HAYASE, H.
(**Studies on *Cucurbita* crosses. VII. The time at which pollen germination on the stigma commences and anther dehiscence**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **5** : 261–67. [Japanese].

Information is provided on the time of optimum germinability of the pollen in a series of varieties of *Cucurbita* spp., using either bud or normal pollen, and subjecting the pollen parents to various temperature treatments.

935 HAYASE, H. & HIRAIZUMI, Y.
(Studies on Cucurbita crosses. X. The osmotic pressure of the various parts of the pistil in the period from the day before anthesis to the day during which anthesis occurs).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 15–18. [Japanese].

Further to the researches summarized in *PBA*, XXVI, Abst. 1864, the authors elucidated the variation of osmotic pressure with time in the pistil of *C. pepo*, *C. moschata* and *C. maxima*. The osmotic pressure of the style increased during the period under consideration; the converse occurred in the ovary. The pH of the ovarian sap rose during the same period. The ability of pollen tubes to grow down the style increased with age of the style.

936 CUTLER, H. C. & WHITAKER, T. W.
***Cucurbita mixta*, Pang. its classification and relationships.**
Bull. Torrey bot. Cl. 1956 : **83** : 253–60.

A survey of the nomenclature of *C. mixta* and a botanical description of the species are followed by a classification of its varieties into three groups based on seed type. The evidence from morphology and interspecific hybridization indicates that *C. mixta* is a good species. The results from interspecific crossing and data on geographical distribution suggest that it is more closely related to *C. moschata* than to *C. pepo* or *C. maxima*.

937 WILSON, J. D., JOHN, C. A., WOHLER, H. E. & HOOVER, M. M.
Two foreign cucumbers resistant to bacterial wilt and powdery mildew.
Plant Dis. Rept. 1956 : **40** : 437–38.

Of more than 300 lines tested in Ohio only PI 200815, 200818 and 222187 showed resistance to *Erwinia tracheiphila*. The first two of these, both from Burma, were also resistant to *Erysiphe cichoracearum*.

938 **(Hazera Company: the tomato variety Kfar Shalem 14).**
Sadeh (Field)/Hassadeh 1956 : **36** : 333–34. [Hebrew].

This new variety has been bred from a cross of Marmande and Dwarf Pearl. The plant is small and compact and requires no support. The fruit is large, resembling that of Marmande. It gives high yields, is very early, and shows a high degree of field resistance to *Fusarium*.

939 MACKINNEY, G., RICK, C. M. & JENKINS, J. A.
The phytoene content of tomatoes.
Proc. nat. Acad. Sci. USA 1956 : **42** : 404–08.

An albino mutant termed ghost, with an unstable chlorophyll deficiency, occurred spontaneously in a normal red-fruited stock. Fruits were obtained by inducing shoots by the grafting of normal scions upon the albino stocks, and from rarely flowering mutants. The albino depends upon a single pair of completely recessive genes, *ghgh*. Its fruits contain high concentrations of phytoene, comparable with those of lycopene and β carotene in the red and orange phenotypes respectively. Analysis of the carotenoid contents of fruits possessing various genotypes with respect to fruit colour provided no evidence that phytoene is a precursor in lycopene synthesis.

940 CHOUDHURY, B.
Embryo culture technique. I. The growth of immature tomato embryo in vitro. II. Embryo factors and immature tomato embryo. III. Growth of hybrid embryos (*Lycopersicon esculentum* x *Lycopersicon peruvianum*) in culture medium.
Indian J. Hort. 1955 : **12** : 143–56.

In investigations at the Horticultural Research Station, Sabour, Bihar, culture of immature embryos at 27 ± 1° C. and 6·5 pH in a medium containing some of the constituents of White's and Tukey's media and some additional ones, together with 30–50% coconut milk, was successful. Embryos from the occasional large seeds, but not from the small seeds, obtained from crosses between *L. esculentum* and *L. peruvianum* were satisfactorily cultured if placed in the above medium with 50% coconut milk and transferred after 7 days to the same medium without coconut milk. The F_1 hybrids were unfruitful. Back crossing to *L. peruvianum* failed. The technique is to be applied to the abortive seeds secured from the back cross to *L. esculentum*.

941 GÜNTHER, E.
Untersuchungen an *Lycopersicon esculentum-Solanum nigrum*-Chimären und ihren Nachkommenschaften. **(Investigations on *L. esculentum-S. nigrum* chimeras and their progenies).**
Ber. dtsch. bot. Ges. 1955 : **68** : Generalversammlungs-Heft : 18–19.

Changes of fruit colour proved to be due to a mutation in the *S. nigrum* component of the graft and changes in leaf form to polyploidy in the internal tissue belonging to *L. esculentum.*

942 GLAVINIĆ, R.
Hybrides végétatifs et sexuels des plantes. (**Vegetative and sexual plant hybrids**).
Bull. Sci. Cons. Acad. Jugosl. 1956 : **2** : 111–12. (Abst.).

At Belgrade University, Yugoslavia, the F_1 and F_2 of crosses between the red-fruited tomato variety Kartofelisni [Potato-leaved] and the yellow-fruited variety Trophée d'or [Golden Trophy] were indistinguishable in their morphological characteristics from the first and second generations, respectively, of vegetative hybrids obtained by grafting Trophée d'or on to Kartofelisni (cf. *PBA*, XXVI, Abst. 3905).

943 TURCHI, A.
Contributo allo studio di nuove varietà di pomodoro. (**Contribution to the study of new varieties of tomato**).
Riv. Ortoflorofruttic. ital. 1956 : **40** : 334–43.

Certain imported cultivars, such as Tuckqueen, Queen and Manalucie, are shown to be worthy of attention for growing in Italy. Descriptions are given of these and a number of other varieties tested.

944 DUMANOVIĆ, J.
[**Polyspermic fertilization and properties of the hybrids of tomatoes (*Lyc. esculentum*) in the F_1 and F_2 generations**].
Zborn. Rad. poljoprivred. Fak./Rev. Res. Wk. Fac. Agric., Beograd 1955 : **3** : No. 2 : 95–116. [Serbian].

An account of experiments at Belgrade on multiparental intervarietal hybridization of *Lycopersicon esculentum,* together with general descriptions of the F_1 and F_2 is given. The hybrids were obtained by pollinating the unemasculated ♀ parent with mixed pollen of other varieties several hours after the pollen of the ♀ parent had been shed. Some F_1 hybrids resembled the parents. In other cases, dominant characters present in the parents disappeared in the F_1 but reappeared in the F_2. Most hybrids were distinguished by improved vigour and increased earliness and yield. The F_1 ripened 2–7 days earlier than the early parent and outyielded the productive parent by 4·00–60·60%. The respective data for the F_2 were 2–11 days and 10·49–64·94%. The greatest improvements in earliness and productivity were observed in the F_1 and F_2 of crosses involving line 20 as ♀ parent.

945 **Find self-sterile tomato.**
What's New Crops Soils 1956 : **8** : No. 9 : p. 23.

It is mentioned that self sterility due to extrusion of the style is under investigation at the Pennsylvania Agricultural Experiment Station for its possible use in F_1-hybrid seed production.

946 **Using male sterility to produce hybrid tomato seed.**
Seed World 1956 : **78** : No. 12 : 15, 27.

At the University of Minnesota, a seed parent line suitable for use in the production of hybrid seed has been developed. It produces normal pollen but is unable to effect self fertilization because of abnormal flower structure. It also carries two recessive markers, potato leaf and green stem, which enable any selfed seedlings occurring in a hybrid population to be recognized.

947 TOMES, M. L., QUACKENBUSH, F. W. & KARGL, T. E.
Action of the gene B in biosynthesis of carotenes in the tomato.
Bot. Gaz. 1956 : **117** : 248–53.

Experiments on the effects of temperature upon the concentrations of lycopene and β carotene in the fruits have provided evidence suggesting that the gene *B* for high content of the latter brings about the conversion of lycopene to β carotene by formation of the β-ionine ring.

948 **Improved paste tomato.**
Agric. Res., Wash. 1956 : **5** : No. 2 : p. 12.

A new paste tomato produced from (Pan America x San Marzano) x Red Top has been named Roma. It is resistant to *Fusarium,* is a bush type of plant and bears plum-shaped fruits. (Cf. Abst. 949).

949 **New paste-type tomato.**
Sth. Seedsman 1956 : **19** : No. 9 : 11, 32.

Roma, a new paste tomato resistant to *Fusarium,* has been produced from Pan American and two unnamed Italian varieties (cf. Abst. 948).

950 GUBA, E. F.
Coordination in breeding tomatoes for resistance to Cladosporium leaf mold.
Plant Dis. Reptr. 1956 : **40** : 647–53.

A brief account of the breeding of red forcing tomatoes for resistance to *Cladosporium* leaf mould is given. A number of lines produced at the Waltham Field Station, Waltham, Mass., are mentioned, of which the most satisfactory for commercial purposes is Waltham Mold Proof Forcing 2–22 [(USDA 44B292 x Improved Bay State) x Improved Bay State]. It has been found that both resistance and immunity are dominant.

951 Chakravarty, A. K., Drayner, J. M. & Fyfe, J. L.
Plant-breeding studies in leguminous forage crops. III. Preliminary studies on the developmental physiology of English stocks of beans (*Vicia faba* L.).
J. agric. Sci. 1956 : **48** : 104–14.

Windsor broad beans came into flowering earlier than either winter or spring types of field bean and were unaffected by any vernalization treatment or successional sowing. When sown in winter, both field bean types flowered at a low node whether vernalized or not, but when sown in summer, flowering occurred earlier and at a lower node if the plants were vernalized than if they were not. The response of spring types to the various treatments was smaller than that of winter types. Date of sowing influenced the number of stems produced.

952 Scheibe, A. & Gottschalk, W.
Morphologische und entwicklungsgeschichtliche Untersuchungen an einer Blatt- und Blütenmutante von *Vicia faba.* (**Morphological and developmental studies of a leaf and flower mutant of *V. faba***).
Angew. Bot. 1956 : **30** : 14–44.

In the lower parts of the plant, the mutant described is characterized by unifoliate leaves, the absence of wings in the flower and occasional floral fasciation. Leaves and flowers formed at later stages in the growth of the plant tend to become more and more normal.

Annual Report of the Agricultural and Horticultural Research Station, Long Ashton, Bristol 1955 : Pp. 224.

953 *Crang, A. & Sturdy, M. A comparison of some varieties of vegetables preserved by canning and by freezing: progress report IV. (pp. 178–81).*

The results of tests carried out for three years on the preserving qualities of the broad beans Harlington White, Taylor's Windsor White, Sussex Wonder and Triple White are reported (cf. *PBA*, XXVI, Abst. 1657). All the varieties were suitable for freezing but only Triple White was satisfactory for canning.

954 *Crang, A. & Sturdy, M. A comparison of some varieties of fruit preserved by bottling and by freezing: progress report VI. (pp. 182–87).*

Information is given on the suitability of 14 varieties of raspberry and 9 varieties of strawberry for bottling and freezing (cf. *PBA*, XXVI, Abst. 1658). Eight varieties of pears were also tested for their quality when bottled.

955 Messedaglia, L.
Per la storia delle nostre piante alimentari. I fagiuoli. (**The history of our food plants. French beans**).
Ann. Accad. Agric. Torino 1953–1954 : **96** : 97–113.

Reference is made to material written in 1553 in which *Phaseolus vulgaris* is described as having been recently introduced into Italy from the New World, and thence to France by Catherine de' Medici on her marriage to the Duc d'Orléans. The *Phaseolus* of classical times belonged, it is submitted, to the genera *Dolichos* or *Vigna*.

956 Kaplan, L.
The cultivated beans of the prehistoric Southwest.
Ann. Mo. bot. Gdn. 1956 : **43** : 189–251.

Collections of cultivated beans from contemporary Indian peoples in the south-western region of the USA and northern Mexico and bean remains from prehistoric sites in the same area were studied. Different types were established on the basis of external seed characters; these types are described by tabular and graphic means. Thirty-two types of *Phaseolus vulgaris* are recognized, 13 of which have been found only among prehistoric remains, 10 only in contemporary collections and 9 in both prehistoric and contemporary samples. Eight types of *Ph. acutifolius* var. *latifolius* were distinguished among prehistoric and contemporary collections; five types of *Ph. lunatus* and two of *Ph. coccineus* have been found only in contemporary collections. Three fairly distinct regions may be recognized with respect to the prehistoric cultivation of beans. These areas correspond to Indian cultural divisions and climatic conditions. It is suggested that beans were prepared for eating by parching and grinding before the time of pottery making. The sources of the different species and types, the times of their introduction, their cultural connexions and their spread within the area in prehistoric and historic times are discussed.

957 **Alabama and Arkansas develop new blackeyes.**
Sth. Seedsman 1956 : **19** : No. 7 : 15, 65.

Giant Blackeye, a new cowpea developed at the Agricultural Experiment Station of Alabama Polytechnic Institute from a selection of Virginia Blackeye, has large pods and large seeds, is easily shelled and is of high eating quality in both the green and the mature condition. Yield is good to excellent in northern and central Alabama.

The Arkansas variety, Monarch Blackeye, has been described in *PBA*, XXVI, Abst. 3924.

958 SMITH, F. L.
Inheritance of three seed-coat color genes in *Vigna sinensis* Savi.
Hilgardia 1956 : **24** : 279–96.

Genetical studies were made of three independently inherited genes governing seed-coat colour and colour distribution in the cross Blackeye 5 x Iron. Gene *B*, resulting in black beans, is completely dominant over *b* which produces brown beans. Through the action of the Watson gene *W* the colour produced by *B* or *b* is distributed in fine dots over most of the testa, most thickly around the hilum. The Holstein gene *H* restricts the colour to about half the seed coat area, the rest of the testa being white with occasional patches of colour. The colour is restricted to a small area round the hilum when both *w* and *h* are present and to a larger area in the heterozygote *Hh*. When both *W* and *H* are present, the colour is continuous over the whole testa.

Deviations from the expected ratios in the F_2 and F_3 populations segregating for the three genes could be accounted for satisfactorily by the assumption that gametes carrying recessive alleles were at a slight selective disadvantage compared with those with dominant alleles.

959 BERNARD, R. L. & CARTTER, J. L.
Five years of tests of soybean varieties for Illinois.
Circ. Univ. Ill. agric. Exp. Sta. 1956 : No. 760 : Pp. 12.

The results are given of trials of 20 varieties, 15 of which have been tested for four or five years in succession at seven localities in Illinois. Tables are given, showing the yield for each year at each locality, and also the five-year averages of yield, lodging, height, seed quality, seeds per pound, protein content, oil content and date of maturity. On the basis of these trials, Blackhawk, Harosoy and Hawkeye are recommended for the northern part of the state, Adams and Lincoln for the central region, and Clark, Wabash and Perry for the southern region. All varieties under test are described and their origin or parentage given.

960 PELLETT, K.
Soybean lab is vital to industry.
Soybean Dig. 1956 : **16** : No. 9 : 8–9.

Among the topics mentioned in this popular account of the work of the US Regional Soybean Laboratory are the use of thermal neutron irradiation to induce mutation and the recent establishment of a large germplasm bank, partly at Urbana, Ill., and partly at Stoneville, Miss. Breeding objectives include disease resistance and improved contents of oil, protein, methionine and lysine.

961 **Made to order for Texas.**
Sth. Seedsman 1956 : **19** : No. 8 : 16, 55.

Bred at the Texas Research Foundation, Renner, Tex., the vigorous new soya bean John Alford is adapted to Texas conditions, has yielded up to 33 bushels of high quality seed per acre and has an oil content of 20% and a protein content of 44%. It is to be released in 1958.

962 FUKUI, J., OJIMA, M. & YARIMIZU, H.
(The after-effects of photoperiodic and temperature conditions during maturation of soya beans on the crop of the next generation).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 5–10. [Japanese].

Various combinations of photoperiodic and temperature conditions were applied to a series of soya bean plots. Plant growth in the next generation was markedly affected by the prior treatment, growth, in general, being proportional to seed size. The effects did not usually persist beyond the F_1, though in the plot subjected to high temperature and natural day-length, the yield after three-years' treatment was greater than after one year.

963 HANWAY, D. G.
Genetic and environmental relationships of components of yield, maturity, and height in F_2-F_3 soybean populations.
Iowa St. Coll. J. Sci. 1956 : **30** : 373–74. (Abst.).

In a study of seed yield and its components, maturity, height and number of branches in the F_2 and F_3 generations of the three possible crosses among Adams, Korean and Chief Selection, number of branches and number of pods on the branches were the most variable characters and days to maturity the least variable. With the exception of mean seed yield, which was higher in the segregating generations than in the higher-yielding parent, the means of most characters in the hybrid populations were intermediate between the parental values. Estimates of heritability, calculated as the regression of F_3 means on F_2 data, were highest for number of days to first flower; highly significant values were also obtained for height, days to maturity, seed weight and number of seeds per pod, while lower but significant values were found for total number of pods, pods on the main stem and number of seeds. Number of days to first flower and from first flower to maturity showed high positive correlations with maturity but low or negative correlations with each other. Number of seeds was highly correlated with yield whereas seed weight was not. The number of pods on the main stem having a low variability and a strong association with number of seeds and yield, it may prove more promising than other yield components as a criterion for selection.

It is suggested that linkage rather than pleiotropy is the most important factor in determining the high genetic correlations tending to occur between characters with moderate to high heritability.

964 Žebrak, A. R.
(Effects of grafting upon the development of heritable characters in peas).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **106** : 1099–102. [Russian].

No changes with regard to length of stem, seed shape and seed colour occurred in F_0 of grafts between Čudo Liona [Lyons Marvel] and Viktorija Željaja [Yellow Victoria].

965 Žebrak, A. R.
(The effect of grafting upon the seed progeny and on the segregation of hybrids in the second generation).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **107** : 325–27. [Russian].

Experiments on peas in Moscow and White Russia showed that grafting homozygous varieties on others did not affect their heritable properties. The mode of transmission of dominant and recessive characters to the first and second generations did not alter after grafting varieties with dominant characters on those with recessive ones or vice versa. Grafting hybrids also did not upset the normal mode of segregation and the F_2 was characterized by the usual ratios of forms with recessive and dominant characters.

966 Warnock, S. J. & Hagedorn, D. J.
Germination and storage of pea (*Pisum sativum* L.) pollen.
Agron. J. 1956 : **48** : 347–52.

Of the various combinations of agar-sucrose concentrations tested, 1% agar + 15% sucrose provided the most satisfactory medium for the germination of pea pollen. The optimum pH for germination was 7·0. Addition of yeast extract to the medium stimulated pollen-tube growth. With storage at − 5° C. over a standard saturated solution of $MgCl_2$, pollen viability was maintained as long as 15 months. Germinability on an artificial medium was correlated with fertilizing capacity as indicated by seed set. The significance of pollen storage in pea breeding is briefly discussed.

967 Oberdorf, F.
Pflanzengemeinschaften und Ertragssteigerung durch indirekte Leistungszüchtung. **(Plant communities and increased productivity by indirect breeding for yield).**
SB dtsch. Akad. LandwWiss. Berl. 1955 : **4** : No. 2 : Pp. 25.

Mixed sowings as a means of increasing productivity and the planting of crops designed to improve the yield potential of the next crop are discussed. Excellent results have been obtained in Eastern Germany from mixed sowings of oats and field peas, poppy and yellow clover and poppy and garden peas. Considerable differences were observed between varieties in their performance in mixed sowings, for example Kleinwanzlebener Felderbse [Kleinwanzleben field pea] and Hödinger Felderbse [Hödinger field pea] gave markedly higher yields in combination with oats than did other pea varieties, and it is urged that breeders devote more attention than hitherto to the development of varieties suitable for such mixed sowings. It is also thought that the development of a cold-resistant field pea variety suitable for mixed sowings with winter rye merits the attention of plant breeders in Eastern Germany.

968 Yen, D. E. & Fry, P. R.
The inheritance of immunity to pea mosaic virus.
Aust. J. agric. Res. 1956 : **7** : 272–80.

Studies of the F_1, F_2 and F_3 and back-cross progenies of crosses involving the resistant varieties William Massey (= Kelvedon Wonder) and Onward and the susceptible varieties Blue Prussian and Greenfeast (= Lincoln) indicated that resistance to pea mosaic virus is controlled by a single recessive gene, here designated *mo*. Plants of the genotype *momo* were resistant, those with *MoMo* susceptible and those with *Momo* displayed a limited tolerance of infection characterized by delay in the development of symptoms and by lack of stunting. Strains of the virus differing in virulence were isolated and a complex virus-host relationship is suggested by differences in type of symptom between some of the susceptible hybrid progenies.

969 Deshpande, R. B. & Jeswani, L. M.
A case of pleiotropy in pigeon pea.
Curr. Sci. 1956 : **25** : 201–02.

The obcordate leaflets with mucronate apices and the filiform keel of the flower, characterizing the variant designated *Cajanus obcordifolia* by Singh *et al.* (cf. *PBA*, XIII, Abst. 1104), depend upon the pleiotropic duplicate factors l_1 and l_2. Since the variant resembles *C. cajan* in the inheritance of other characters, it should be assigned to this species.

970 Cabanillas, E. & Spencer, J. L.
Improved USDA-34, a better sweet corn (maize) for the tropics.
World Crops 1956 : **8** : p. 371.

Developed at the Federal Experiment Station, Mayagüez, Puerto Rico, Improved USDA–34 shows several improvements over the standard USDA–34, notably better quality, better husk protection against insects, elimination of the tendency of the culms to break, greater vigour and earlier ripening. It is the result of crossing, selfing and selection among a large number of strains of USDA–34.

971 Ditman, L. P., Todd, H. S. & Harrison, F. P.
Investigations on insects attacking the sweet corn ear.
Bull. Md. agric. Exp. Sta. 1955 : No. A–82 : Pp. 16.

This report is divided into three parts; (1) a comparison of different types of mineral oil for use in spraying, (2) experiments on timing and frequency of spraying, and (3) studies on varietal differences in reaction to spraying. Plants of twelve varieties were raised in such a manner as to ensure that they would all ear at the same time and were sprayed twice with DDT-oil emulsion sprays, once when 20–30% of the plants were in the silking stage and again four days later. Marked varietal differences were observed in the effects of the spray, the extent of earworm (*Heliothis armigera*) reduction ranging from 80·7% in Victory Golden to only 18·7% in Evergreen Hybrid 3 x 33. In the untreated control, comparatively little difference between varieties was observed, although varieties with tight husks, such as Peoria, Victory Golden and Hoosier Gold, were least infected. An assessment of all the twelve varieties in respect of resistance both to earworm and sap beetle and effectiveness of DDT-oil emulsion sprays showed Peoria, Victory Golden and Hoosier Gold to be superior. However, sap beetle and earworm did not show similar response to earworm treatment on all the varieties tested, for example on Golden Cross Bantam the treatment was comparatively effective against earworm but inflicted little damage on the sap beetle population.

972 Bowman, D. H.
New crops tested at Delta Branch Station. Popcorn hybrids.
Miss. Fm. Res. 1956 : **19** : No. 2 : 1, 5.

Iopop 6 and Purdue 32 are recommended for growing in the Mississippi Delta region, as a result of tests carried out since 1952 at the Delta Branch Station, Stoneville.

973 Tsuda, C.
(**Cytological studies on Mentha plants. II. On meiosis in *M. viridis* L. subsp. *crispata* Briq.**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 32–38. [Japanese].

A detailed description of meiosis in the above form is given. There are $2n = 48$ chromosomes. Meiosis is fairly regular but secondary association and laggards were frequently noted. It is inferred that $x = 6$ (cf. *PBA*, XXV, Abst. 2544).

BOOK REVIEWS

Ashby, W. R.
An introduction to cybernetics.
Chapman & Hall Ltd., London 1956 : 36s. : Pp. ix + 295 : figs.

Opinions are deeply divided on cybernetics. Some of its exponents see it as a major integrative study basic to physics, biology, psychology, sociology and economics; its critics express doubt as to whether it has contributed significantly to any field of study outside of telecommunication. Dr. Ashby's book should assist considerably in enabling an assessment of the potentialities of cybernetics to be made since it is an outstanding example of lucid scientific exposition. It is in fact an initiation into cybernetics rather than an introduction since the author takes great pains, by his clear explanations, modest mathematical demands and numerous examples and exercises to inculcate a cybernetic attitude in his readers. Cybernetics is taken throughout in its most general sense as the study of the behaviour of "all possible machines," machine being understood to include such systems as cells, brains, organisms and biological populations. Throughout the book, the author has the biologist very largely in mind and the examples treated are frequently drawn from this domain.

The book is in three parts. General principles are laid down in the first. A straightforward account is given of the basic cybernetic concepts of transformation, closure, cinematic graph, canonical representation, vector, parameter, coupling, feedback, stability, isomorphism and homomorphism. This leads to a discussion of black-box theory in which the problem of making inferences as to the internal structure of a system only known from input and output signals is considered. An important conclusion concerns the past history or "memory" of a system. It is shown that memory is not an attribute which a system either does or does not possess. Granted sufficient data on the present behaviour of the system, memory can always be eliminated as an explanatory factor. In the middle part of the book, further cybernetic notions are introduced, in particular, variety, constraint, entropy and noise. This part owes much to the communication theory of C. E. Shannon. The notion of constraint is fundamental since the cyberneticist prefers to regard a property or mode of behaviour as a constraint or restriction on a set of possibilities rather than as a unitary characteristic. The last part of the book is devoted to regulation and control.

There are several discussions of direct or indirect genetical interest. Thus on p. 167, treatment of population equilibrium as a Markov chain is discussed; on p. 198, the genome is treated as a system protected by various regulators which block the transmission of excessive cybernetic variety from the environment to the genes; on p. 252, the action of the genes in determining development is taken as an instance of communication between a designer and a machine, whereby the designer, itself a machine, selects a particular model from the range of possible machines; finally, on p. 270, gene action is treated as an example of amplifying regulation.

The standard of exposition of the book is quite unusually good, and so we find ourselves, by positive feedback, reconsidering our initial query. Granted the possibilities of an elegant unitary cybernetic treatment of a diverse range of dynamic systems, does this contribute anything, say to genetics, that it does not possess already, or simplify or clarify any existing obscurity? Till now the answer has been negative. Whether the future will reveal otherwise will presumably depend on geneticists' encountering problems that respond better to cybernetic than to classical methods of investigation.

HARTMANN, M.
Gesammelte Vorträge und Aufsätze. I. Allgemeine Biologie. II. Naturphilosophie. (**Collected lectures and essays. I. General biology. II. Natural philosophy**).
Gustav Fischer Verlag, Stuttgart 1956 : DM 48 : Pp. 403 : (Part I.) ; DM 28 : Pp. 246 : (Part II.) : figs : tables.

Professor Hartmann has spent a long working life elaborating the theory of bipolar sexuality (cf. *PBA*, XXVI, p. 527) and on the occasion of his eightieth birthday gives us these two volumes of collected essays, selected from a series of writings published over the period from 1903 up to the present time. Those in the first volume are all concerned directly or indirectly with the problems of fertilization and sexuality and include an interesting article, published in 1912, demonstrating the relationship of chromosome reduction to Mendelian segration by means of a reexamination of results published by Lang on segregation in parthogenetic progenies of heterozygous individuals of *Tachea* spp.

The second volume comprises essays on natural philosophy, in which the influence of his cousin Nikolai Hartmann is expressed strongly.

DODSON, E. O.
Genetics. The modern science of heredity.
W. B. Saunders Co., Philadelphia & London 1956 : 45s. 6d. : Pp. vi + 329 : 159 figs. : 15 tables.

Professor Dodson's *Textbook on Evolution* was reviewed in *PBA*, XXII, p. 626. Like its forerunner, the present volume is a remarkable accomplishment in the art of condensation and very few relevant aspects of contemporary genetics are omitted. As in the earlier volume too, the author avoids those tendentious philosophic overtones that characterize so high a proportion of recent genetical treatises.

The book starts with an exposition of elementary Mendelism and of its cytological basis, and then, after a chapter on simple statistics, describes how Mendelian inheritance is modified by sex and autosomal linkage, lethal genes, multiple allelism and polymeric genes. From here, we pass on to chromosomal aberrations, for which the author retains the term chromosome mutation, gene mutation, sex determination, the nature of the gene and cytoplasmic inheritance. The author is a little reckless in presenting the Watson and Crick model for deoxyribonucleic acid as an accepted fact. In general, however, controversial issues are treated with exemplary impartiality, as for example, in the account on pp. 210–12 of Goldschmidt's theory of the gene. Occasionally the distinction between reality and its abstract representation becomes a little blurred as when the Hardy-Weinburg Law is described as a conservative factor in evolution, but in general the standard of exposition is high.

Genetical applications are kept in mind throughout and there are special chapters on genetics in agriculture and human genetics.

The book is produced in dual colour, black and rust, and presents something of the sumptuousness of a rubricated incunabulum. Annotated references follow each chapter.

Among other features of special interest are some hitherto unpublished information on the life of Mendel and a reprint of the English translation of Mendel's fundamental paper published by the Royal Horticultural Society, London.

GOOD, R.
Features of evolution in the flowering plants.
Longmans, Green & Co., London, New York & Toronto 1956 : 30s. : Pp. xv + 405 : 162 figs.

In this rather uneven book, Professor Good discusses the evolution of flowering plants, with special emphasis on those aspects of evolution that recent writers have tended to ignore but which the botanical taxonomist cannot avoid.

The discussion on the floral structure of the Asclepiadaceae and Compositae (chaps. 7–10) is perhaps the most interesting part of the book. The author describes in considerable detail the wide range of floral structure encountered in the former family and shows that no satisfactory explanation based on selective value has yet been devised for the various forms manifested by the corona and gynostegium. Of special interest in this connexion are the "false" sexual organs developed in some genera from the corona or stigma head; these are sexually nonfunctional but mimic the shape and arrangement of stamens and styles in some detail. Another difficulty that the Asclepiadaceae pose for the neo-Darwinist concerns the evolution of the specialized pollination mechanisms. These are so complex that it is difficult to conceive how they could have evolved by a chain of small-step mutations.

The author crystallizes his views on the Composite inflorescence by comparing the flowers of *Cosmos bipinnatus* and *Anemone japonica*, which are similar in size, shape, colour, general proportions and the production of 1-seeded indehiscent "fruits" without any special dispersal mechanism. Since the *Anemone* produces rather more embryos per flower than the *Cosmos* does per head, the author permits himself to doubt the benefit of the presumed long evolutionary history that has led from the Ranalian to the Composite type of floral structure.

Professor Good summarizes his views in the conclusions "that these plants though providing little evidence in favour of orthogenesis, show even fewer indications of evidence against it; that they reveal no evidence that natural selection has played an important part in their evolution though they provide many indications that this has not, in fact, been the case; and that they suggest that mutation, on a comparatively large scale, has been a frequent and potent factor in their history."

The earlier chapters deal with differences between plants and animals and with the salient characteristics of the major "biological groups" of monocotyledons and dicotyledons. By biological group the author means "those sorts of plants which make appreciable and biologically distinctive constributions to the biota and its environment as a whole"; 29 groups of monocotyledons are recognized, 17 isolated groups of dicotyledons, 24 semi-isolated dicotyledon groups and a residual "central mass of dicotyledons." Some of these groups correspond to taxonomic families or groups of families, e.g. the Cyperaceae and the Casuarinaceae; others are assemblages from several taxonomically remote families, e.g. the group of saprophytic Monocotyledons, while others are segments of families, such as the zygomorphic Violaceae. A considerable body of numerical data on the distribution, frequency and size of taxa accompanies these chapters but nothing very definite emerges from it.

Taxonomic data are obviously those with which the author is most at home. His excursions into biochemistry, physiology and plant anatomy are less assured and the references to protoplasm as the basis of life somewhat archaic in tone. Several of the problems posed by the author on such topics as biological success and advantage are largely matters of logic and definition and would be largely resolved by a prior logical analysis of the concepts being used.

The arguments presented in the book would have been more easily appreciated if the author had been able to keep a tighter grip on sentence construction. The illustrations to the book however, by Miss Malins, are of outstanding quality.

Bourne, G. H. & Danielli, J. F. (Editors)
International review of cytology. Volume V.
Academic Books Ltd., London 1956 : \$11.50 : Pp. 570 : figs. : tables.

The new volume of this series (cf. *PBA*, XXVI, p. 124) retains its wide field and international character. In The chemical composition of the bacterial cell wall, C. S. Cummins shows the advances that have been made possible in our knowledge of this subject owing to the use of the electron microscope and paper partition chromatography; the walls are characterized by their extreme insolubility and are in many species composed of a relatively small number of basic units, in *Streptococcus pyogenes* for example only rhamnose, two hexosamines and three aminoacids; certain taxonomic differences have been detected, since rhamnose is characteristic of streptococcal cell walls and arabinose of corynebacteria; on this basis it has been possible to suggest that certain species be reclassified. In Theories of enzyme adaptation in microorganisms, J. Mandestam reviews evidence in favour of the view that in enzyme adaptation all the cells of a population become capable of producing the enzyme concerned and that the enzyme is produced by the complete synthesis of a new protein from free aminoacids rather than by modification of an existing protein; of the various hypotheses concerning the mechanism of adaptation examined, that invoking plasmagenes is found still to rest on inconclusive evidence; the specific-precursor hypothesis has been given up by its author in favour of the organizer hypothesis, one version of which visualizes DNA as a template determining the formation of specific RNA which then catalyses the synthesis of the enzyme; Hinshelwood's kinetic model is found to provide a useful prediction of the behaviour of bacterial enzymes in certain conditions but not to serve as an explanation of enzyme adaptation in general; the extended mass-action hypothesis is defined as follows: "the enzymes and other proteins of the cell are in dynamic equilibrium with one another through a common pool from which they are all synthesized, and the end product of an enzyme reaction is partly catabolized and partly contributed to the pool. The pool is assumed to contain all materials needed for the synthesis of proteins—aminoacids, energy source, vitamins, inorganic ions, etc." None of the hypotheses is found to cover all the facts. In The results of cytophotometry in the study of the deoxyribonucleic acid (DNA) content of the nucleus, R. and C. Vendrely explain the methods of cytophotometry, the theoretical premises upon which they are based and the main results that have emerged from its use; these include the confirmation of a constant relationship between the DNA per nucleus and the number of chromosomes in the cell in animal species and in many plant species too; it has been shown that DNA synthesis occurs in interphase just before the cell undergoes mitosis or meiosis. In The ultrastructure of cells as revealed by the electron microscope, F. S. Sjöstrand reviews the results of recent electron-microscope studies of cells in ultrathin sections, giving some words of caution concerning techniques and interpretation; the findings reported include details of the internal structure in mitochondria, illustrated by some excellent photomicrographs; the writer considers however that there is still no real information regarding the localization of enzymes within the mitochondria; the studies have revealed details of the structure of the Golgi apparatus and of the cell membrane and some of its components, the membrane having every appearance of being a labile dynamic structure; the structure of cilia, of the ground substance of the cytoplasm, of chloroplasts and of the nuclear membrane has been elucidated, the nuclear membrane having a complicated organization probably related to differences in permeability properties; on the other hand little light has been shed so far on the structure of the nucleus itself.

The volume also contains contributions on Protoplasmic contractility in relation to gel structure: temperature-pressure experiments on cytokinesis and amoeboid movement by D. Marsland and Intracellular pH by P. C. Caldwell.

Gaebler, O. H. (Editor)
Enzymes : units of biological structure and function.
Academic Books Ltd., London & New York 1956 : \$12.00 : Pp. 624 : figs. : tables : plates.

The three previous Henry Ford Hospital Symposia were devoted to strictly medical themes. The present symposium, held like the others at the Henry Ford Hospital, Detroit, is of considerable general biological and genetic interest. Most of the participants were from North America, two from France and one from England.

The first paper, Remarks on the mechanism of enzyme induction, by J. Monod, discusses the induction of β-galactosidase in *Escherichia coli*. Induction depends on the uptake and intracellular concentration of an enzyme or system designated *y*. The *y* system, once constituted within a cell, tends to perpetuate itself, thus mimicking genetic transmission of an acquired characteristic. B. Ephrussi writes on Enzymes in cellular differentiation. The topics discussed are the irreversibility or not of differentiation and theories of the mode of gene action on differentiation. The proportion of hypothesis to fact in this field is extremely high. E. F. Gale, in Nucleic acids and enzyme synthesis, discusses the relationship between DNA, RNA and enzyme synthesis. In particular, he describes evidence that some, but not all, enzymes require cosynthesis of RNA for their production. S. Spiegelman, On the nature of the enzyme-forming system, reviews various possible mechanisms and comes down in favour of an RNA template.

The preceding papers dealt with enzyme synthesis mainly from a biochemical point of view. They are followed by four genetical papers. The first of these, Genetic structure and function in bacteriophage T2, by A. D. Hershey, provides evidence, from chloramphenicol inhibition experiments, that synthesis of phage DNA is independent of concurrent protein synthesis. R. D. Hotchkiss, in The genetic organization of the deoxyribonucleate units functioning in bacterial transformations, reviews the evidence on the number of genes carried by transformer particles and on their mode of incorporation into the host genome. The next two papers, N. H. Horowitz and M. Fling, on The role of the genes in the synthesis of enzymes and C. Yanofsky, on Gene interactions in enzyme synthesis, consider the one gene-one enzyme hypothesis; the former paper defends the hyopthesis in the modified form that several genes may cooperate in the formation of one enzyme but that several enzymes are not directly produced by one gene; in the latter, evidence that different parts of the tryptophane synthetase molecule in *Neurospora* are produced by different but adjacent gene loci is provided.

Three papers, G. E. Palade, on Electron microscopy of mitochondria and other cytoplasmic structures, A. L. Lehninger, on the Physiology of mitochondria, and E. L. Kuff and G. H. Hogeboom, on Sedimentation and biochemical characteristics of cytoplasmic particles, provide a useful synopsis on the fine structure and biochemistry of the mitochondria and microsomes. They are followed by an important paper by D. Mazia on Nuclear products and nuclear reproduction. By grafting a "hot" P^{32} nucleus of *Amoeba proteus* into a "cold" host, it was possible to demonstrate that cytoplasmic RNA is derived from nuclear RNA and that nuclear RNA is not derived from cytoplasmic RNA. In another experiment, observations on chromosomes of *Crepis capillaris* with labelled DNA showed that, at anaphase, the distribution of the labelled DNA to the poles is markedly unequal. This experiment is difficult to reconcile with Watson and Crick's hypothesis of DNA duplication in which an equal distribution of parental DNA between the daughter chromosomes would be expected.

One other paper calling for specific mention is on Interference with nucleic acid metabolism by A. D. Welch, which provides a useful summary of present knowledge on the biosynthesis of the nucleic acids.

In addition to the formal papers, comments and reports of discussions are included. These are, in some cases, of particular interest since they ventilate the research problems of the immediate future. Thus, M. Cohn provides some further information on β-galactosidase induction; J. Lederberg points to weaknesses in the one gene - one enzyme hypothesis; S. Spiegelman remarks that, in searching for hypothetical enzyme precursors "one has to decide how long one should continue to look for a thing one can't find even by methods which one believes might well prove adequate. Well, we made that decision about a year and a half ago—to quit"; and J. Monod maintains that "the widely accepted concept of an inherent 'dynamicity' associated with the 'biological state' of proteins in living cells has no adequate experiment basis, besides being clearly disproved in at least one case."

The remaining contributions to the symposium, which are of more special enzymological interest, are as follows: D. I. Arnon, Localization of photosynthesis in chloroplasts; W. F. H. M. Mommaerts, The actomyosin system and its participation in organized enzyme reactions; M. F. Morales, Is energy transferred from ATP to myosin at the moment that ATP is split?; J. V. Taggart, Enzymatic aspects of excretory mechanisms; G. Wald, The biochemistry of visual excitation; W. D. McElroy and A. Green, The enzymatic basis of light emission; E. H. Stotz, M. Morrison and G. Marinetti, Components of the cytochrome system; T. P. Singer, E. B. Kearney and V. Massey, Succinic dehydrogenase; B. Chance, Interaction of adenosinediphosphate with the respiratory chain; D. E. Green, Structural and enzymatic pattern of the electron transfer system; M. D. Kamen, Hematin compounds in the metabolism of photosynthetic tissues; B. D. Davis, Relations between enzymes and permeability (membrane transport) in bacteria; J. H. Quastel, Action of drugs on enzyme systems; and C. F. Cori, Regulation of enzyme activity in muscle during work.

MACHLIS, L. & TORREY, J. G.
Plants in action. A laboratory manual of plant physiology.
W. H. Freeman & Co., San Francisco and Bailey Bros. & Swinfen, Ltd., London 1956 : 32s. : Pp. vi + 282 : 38 figs. : 4 tables : illus.

Class experiments in plant physiology may be useful in providing students with a perfunctory knowledge of techniques, but in view of their notorious unsatisfactoriness in giving the expected and desired results, their more usual and perhaps more useful function is to tax the student's brain with the problem of why they did not work. This manual appears to be an attempt to make experiments as foolproof as possible. It begins with an illustrated account of the equipment likely to be found in a plant physiology laboratory (the equipment illustrated includes test tubes, beakers, matches as well as more elaborate apparatus such as Bunsen burners, clamps and tongs), and describes all possible safety precautions, warning students to use razors and scalpels with care and not to eat the plant materials provided for laboratory work. The experimental work, which is of a standard suitable for general degree work, is divided into four sections, on plant development, mineral nutrition, water relations and cellular metabolism, 57 experiments, many of them illustrated, being described in all. Each experiment is described in careful detail and is preceded by a theoretical discussion of the physiological principles involved, the notes on carbohydrate metabolism being particularly useful. For the benefit of the student in reporting his experiments and of the instructor in marking them, nearly half the volume is taken up with perforated detachable report sheets carrying blank tables and spaces in which the student may write in his experimental results and conclusions. There are three appendices, one on electromagnetic radiation, one on the determination of the standard deviation and standard error and one providing the instructor with detailed information on equipping the laboratory, on a suitable schedule for experiments and on the duration of and materials and apparatus needed for each experiment.

TRAPP, A.
Zur Morphologie und Entwicklungsgeschichte der Staubblätter sympetaler Blüten. (**The morphology and development of the stamens of sympetalous flowers.**)
Gustav Fischer Verlag, Jena 1956 : Bot. Stud. No. 5 : DM 7.20 : Pp. 93 : 65 figs.

Interest in pure morphology, inspired largely by the work of Goebel and Troll, is probably more widespread today in Germany than in any other country. Dr. Trapp's study is a straightforward comparative morphological description of the anthers of selected sympetalous genera, with special emphasis on ontogeny. There are two parts to the account, the first devoted to the single stamen and the second to the andrecium as a whole. Most of the part concerned with the single stamen deals with the anther and with modifications in anther structure brought about by loss of a theca or by thecal fusion. The various forms of attachment of the anthers to the filament and of the relative disposition of the thecae and connective are also described. In the second part, the main topics are symmetry and asymmetry of the andrecium and synanthery.

The conceptual framework which the author uses is that of classical morphology, the usual criterion of morphological status being ontogenetic. Considerations based on floral biology or phylogeny hardly enter. Just occasionally, as in those members of the Acanthaceae which have only one anther lobe, ontogenetic criteria of morphological status fail and a momentary retreat from pure morphology to putative phylogeny has to be made. The text is illustrated by numerous line drawings.

NAPP-ZINN, K.
Beiträge zur Anatomie und Morphologie der Involucral- und Spreublätter der Compositen. (**Contributions to the anatomy and morphology of the involucral bracts and paleae of the Compositae**).
Gustav Fischer Verlag, Jena 1956 : Bot. Stud. No. 6 : DM 9.50 : Pp. 116 : 47 figs.

The structure of the involucral bracts and receptacular scales of the Compositae has intrigued morphologists ever since the publication of Daniel's series of papers on this topic at the end of the last century. In the present volume, Dr. Napp-Zinn records the results of an extensive morphological and anatomical examination of these structures in representative genera of all the main Composite tribes. Dissociating himself from Fricke, the author affirms his conviction that anatomical structure can be validly used to ascertain morphological status. By combining the data concerning external form with those relating to internal structure, the author not only concludes that the involucral bracts are foliar in nature but that even more detailed homologies can be established. He concludes that some bracts are equivalent to whole leaves, others to the lamina, petiole or sheathing base of a leaf or to some combination of these. The receptacular scales present a rather more complex problem. In some cases they are regarded as foliar and in others as emergences, and reductional series from foliar to what would otherwise be regarded as nonfoliar are described.

The author's very thorough investigation of his material has led to a very useful corpus of morphological data on the Composite flower. He interprets his results in strict accordance with classical morphological concepts and with an acceptance of detailed homologies between parts of plant organs. Morphologists who have broken with the classical tradition will also find the data presented here very useful but will draw rather different conclusions from them.

Pawłowski, B.
Flora Tatr. (**Flora of the Tatras**).
Państwowe Wydawnictwo Naukowe, Warszawa 1956 : Vol. 1 : Pp. 672 : 130 figs.

One of the most striking botanical developments in eastern Europe in the last decade has been the production of new floras, most of which have represented a considerable advance over their predecessors. The first volume of a new flora of the Tatras has now been received which should prove of great value to all those interested in the montane flora of Central Europe. The plants covered in the present volume are the pteridophytes, gymnosperms and the choripetalous dicotyledons. The specific descriptions are followed by notes on the ecological communities in which they occur and on the distribution of the species in the Tatras, in the Carpathian range as a whole, and in general. Figures of critical species are included. Keys are provided to the families, genera and species. The systematic descriptions are preceded by a conspectus of the ecological communities recognized and by a glossary of botanical terms.

Though the Polish language in which the flora is written will naturally limit its usefulness elsewhere, the Latin preface and Latin equivalents in the glossary will assist considerably in rendering the flora usable by non-Polish systematists.

Andrews, F. W.
The flowering plants of the Sudan.
T. Buncle & Co., Ltd., Arbroath, Scotland 1956 : 21s. : Pp. vii + 579 : 145 figs.

In the third and final volume of this flora (cf. *PBA*, XX, p. 592 and XXIII, p. 342) the remaining 20 dicotyledonous families, ranging from Compositae to Labiatae according to Hutchinson's classification, and the 32 families of monocotyledons are described. As in the previous volumes, the keys are well laid out, the descriptions of species are short and clear and many of the illustrations are of a high standard. The desirability of arranging the genera within each family or within the groups into which the larger families are divided in alphabetic order rather than according to taxonomic affinities may be questioned, but this shortcoming detracts little from the value of a work which will remain the standard flora of the area for many years to come.

Norman, A. G. (Editor)
Advances in agronomy. Volume VIII.
Academic Press Inc., New York 1956 : Pp. xi + 423 : figs. : tables.

This year's issue (cf. *PBA*, XXVI, p. 126) once more contains a number of contributions relating to plant breeding. Thus in Progress in grass breeding D. C. Smith gives an outline of some of the advances made in recent years in breeding forage grasses; many of the improved varieties now in cultivation have been obtained by selection from material growing in the wild state, others by crossing between these selections and many by synthesis of a strain from five or more selected plants and it is pointed out that great genetic variability exists within all species and varieties of grasses; the role of cytological irregularities, many of them associated with interspecific and intergeneric crossing, in maintaining this variability is illustrated in a number of different grasses including those belonging to the genera *Bromus*, *Stipa*, *Oryzopsis*, *Festuca*, *Lolium*, *Elymus*, *Poa* and *Agropyron*; possible agronomic advantages to be expected from wide crosses are mentioned briefly. Studies on inbreeding, combining ability, the production of synthetic varieties and methods for testing agronomic value and properties such as nutritive value, palatability and disease resistance are other aspects considered and some suggestions for further lines of investigation are made.

In The evaluation of crop plants for winter hardiness, S. T. Dexter considers the importance of cold tolerance in a number of crop plants, winter wheat being referred to as *Triticum sativum*; a number of morphological and other characteristics commonly associated with winter hardiness are considered, different views on the nature of cold damage and of hardiness are discussed and methods of estimating it in living plants are examined.

J. R. Cowan writes on Tall fescue, a grass introduced to America from Europe probably over a century ago, but having only recently established itself as an important agricultural crop; the many merits of the species that account for its rapid gain in popularity are examined, together with some of its defects. The literature on the genetics and cytology of *Festuca arundinacea*, which is regarded as an alloploid species with $2n = 42$, and on its relationship with other species and genera is reviewed briefly. An account is given of the production of Alta, Kentucky 31 and certain other varieties, reference being made to a monument erected to Kentucky 31 in recognition of the contribution it has made to grassland agriculture! In 1949 an extensive breeding programme was initiated on tall fescue at the Oregon Agriculture Experiment Station, Corvallis, Oregon and the activities carried on under this project are outlined: they have included studies of flowering behaviour, self fertility and sterility, and selection for high yields of seed and forage; we read that an increase of at least 50% in forage yield can be effected by selection, that an introduction from North Africa starts its growth only in the autumn and grows throughout the winter in Oregon, that the time required to produce 100 g. of dry matter ranged from 41 to 256 days in different plants and that a 10% difference in protein production was also observed; improvements in quality are envisaged from selection on the basis of protein content, digestibility and palatability to animals.

DALE, H. E.

Daniel Hall. Pioneer in scientific agriculture.

John Murray, London 1956 : 21s. : Pp. xi + 241 : plates.

In writing a biography of one of the pioneers of scientific agriculture the author has contrived to present to the reader a short history of the development of three of the most important institutions concerned with teaching and research in agricultural science: Wye College, Rothamsted Experimental Station and the John Innes Horticultural Institution. Sir Daniel Hall was director of all three in turn and largely responsible for developing them on the lines with which we are now familiar. In the course of these developments we witness the birth of familiar sciences such as soil chemistry, applied statistics and genetics and of institutions such as the Development Commission, the Farm Institutes, a rudimentary Advisory Service, the Commonwealth Agricultural Bureaux and the Agricultural Research Council.

Interesting sidelights are thrown on Hall's reactions to the political machine, his opinion (not always flattering) of farmers and their standard of education, and on his many and varied tastes, ranging from fishing and bridge, to the breeding of tulips, the collection of Japanese prints, wine and Chinese pottery, and the enjoyment of poetry, Mozart's music, French literature and foreign travel. His impressions are often described vividly in quotations from Hall's own writings: "American food seems even more unattractive than I had remembered it" he writes on his second visit to the USA and his conversation with President Coolidge is described as "reasonable but ordinary." Of double tulips he aptly remarks that they are more lasting "but it is no gain that a nightmare should endure for two nights instead of one." Many contemporary poets are also dubbed, as thinkers, "commonplace." He was an early advocate of planning and sums up his arguments in the statement "the world is changing too rapidly in certain directions to allow the whole of wisdom to be summed up in 'Wait and see'." The biographer has succeded in giving us a picture of a distinguished man of many parts, though in doing so he has not concealed a certain amateurish quality in some of the pronouncements, more especially on subjects such as aesthetics or philosophy, which is perhaps understandable in a man of science whose activities covered such a wide range of subjects, both scientific and otherwise.

Clifton, C. E. (Editor)
Annual review of microbiology. Volume 10.
Annual Reviews, Inc., Palo Alto, California, USA 1956 : $7.00 : Pp. vii + 426 : figs. : tables : plates.

This year's volume differs from those of previous years in the series (cf. *PBA*, XXVI, p. 321) in containing a review of the microbiological and immunological literature published in 1955 in the USSR, by P. Grabar of the Institut Pasteur in France; the review starts with some remarks concerning the differences in fields of interest noted between Russian and Western investigators and a list of the main journals in which the material reviewed has been published; although the review is written in English the titles of the 195 works listed in the bibliography are given in French. In Cytology of bacteria, G. Knaysi reviews most of the literature of 1954 and 1955, together with a certain number of papers from previous years; aspects dealt with are nucleus, slime layer, cell wall and flagella. G. Pontecorvo writes on the parasexual cycle in fungi, showing how the phenomenon of parasexual recombination, defined as "recombination of hereditary determinants outside the sexual cycle," can be used in chromosome mapping in certain organisms such as *Aspergillus nidulans* and that since the phenomenon occurs in several asexual species it can serve for mapping in these organisms too. It is shown how the parasexual cycle, though less perfect, is more flexible in storing gene variation than the sexual cycle and may be operative in the production of new races of pathogenic fungi. Other subjects reviewed in this volume include Factors affecting resistance to infection, Mutual relationships in fungi and Problems of incubation in plant diseases.

(Material on the history of agriculture in the USSR. Symposium II).
Akadamija Nauk SSSR, Moskva-Leningrad 1956 : 30r. 35k Pp. 747. [Russian].

The symposium comprises a series of articles dealing with the history of introduction of a number of the main economic plants into Russia. They are as follows:—

Jakubciner, M. M. (*History of wheat growing in the USSR*). (*pp. 16–169*).

Much excavation work has recently been done in the Soviet Union and has thrown light on the antiquity of wheat cultivation there in early times. For instance evidence has been obtained of the cultivation of *Triticum durum* in the Ukraine in the 4th century BC and soft wheat in the Crimea as early as the 8th century BC; it was common in the Colchic civilization of the 5th century BC. Wheats of other species such as *T. macha*, *T. carthlicum*, *T. dicoccum*, *T. timopheevi* and even *T. monococcum* were also sown in ancient times and their cultivation in certain areas of Transcaucasia and other Soviet territories has continued until recent times. *T. turgidum* became popular in later periods, branched forms being cultivated at various times from the 18th century on.

The development of wheat cultivation in each of the main territories comprising the Soviet Union from the earliest times is traced, with indications of the species and varieties grown, the activities of the research stations that produced them, the areas grown and the yields obtained. The important role that Russian wheats have played in breeding the wheat varieties of the USA, Canada, Australia and elsewhere is emphasized and the interesting case of the variety Krymka is cited: this wheat, introduced to the USA, gave rise among others to the variety Kanred-Fulcaster, which was later used by the Kubanj research station and gave rise to the popular Russian wheat Vorošilovskaja.

Another interesting point that emerges is the increasing popularity of *T. durum* in many areas, particularly those where virgin land has been taken into cultivation. On the other hand the area under *T. dicoccum* has very much diminished. There were 161 different varieties of winter wheat grown in 1955, together with 139 spring varieties; of these, 55 of the winter and 36 of the spring varieties were wheats produced in the Soviet Union.

Pisarev, V. E. (*The question of the origin of agriculture and field crops in eastern Siberia*). (pp. *170–203*).

A study of the field crops of this area has shown that a great number of the strains grown differ sharply from their counterparts in European Russia: they are characterized by extreme earliness, resistance to spring drought, low heat requirements, small grains and low stature. Data are presented to show that these types were developed before the Russian occupation of Siberia in the 17th century. Similar forms have been found by the Soviet expedition to Mongolia, where they have been introduced in the majority of cases from China. The spring wheats of eastern Siberia have in common with those of China not only a number of morphological and physiological features but also certain genetical peculiarities such as an unusual propensity for crossing with spring rye, maximum sets of 64·7 and 70·4% having been obtained with the two groups respectively. Close similarities were observed between the Mongolian varieties of naked barley, oats and millet and those of eastern Siberia. The Siberian buckwheats have pink or red flowers, a feature they possess in common with the Chinese forms. Archeological finds dating from the first and second centuries BC show that cultural contact existed at that time between Siberia, Mongolia and China.

In contrast, the spring rye varieties of Siberia are thought to have originated by selection from the winter rye introduced by settlers from European Russia, whilst the hemp seems to be a product of hybridization between forms brought from European Russia and wild Mongolian hemps. Some of the settlers later brought the early-maturing Siberian spring wheats back with them and introduced them into certain northern areas of European Russia.

Bahteev, F. H. (*History of barley cultivation in the USSR*). (*pp. 204–57*).

Evidence of the cultivation of barley has been found in archeological material from the Crimea dating from the 9th to 8th centuries BC, in Armenia from the 7th to 6th, in Central Asia the 5th to the 4th and in the Ukraine from the 4th to the 3rd centuries BC. The remains from the Crimea in the 3rd and 2nd centuries show the existence of a multiplicity of forms, some of which possessed sessile central florets as in some of the present-day wild barleys. The results of these investigations do not accord with the view that *Hordeum agriocrithon* represents the progenitor of the modern cultivated six-rowed barleys. A round-grained, awnless, naked barley was grown in Armenia in the beginning of the Bronze Age and earlier and is referred to as *H. antiquorum sphaerococcum*; the forms found in Armenia and the Crimea represent a barley with bottle-shaped grain, referred to as *H. lagunculiforme*, which is no longer known today.

An account is given of the conditions of barley growing in Russia in the 17th and 18th centuries and its development in the 19th and 20th, with information on the types and varieties grown and the part played by the world collections at Leningrad in developing suitable barleys for cultivating in different areas of Russia. As a result of this work the first smooth-awned varieties, a naked-grained variety suitable for bread making and other novelties were developed.

Lehnovič, V. S. (*The history of potato cultivation in Russia*). (*pp. 258–400*).

An account is given of the introduction of the potato into different countries of Europe, based on publications by Salaman (cf. *PBA*, XIX, p. 928) and others, and into Russia, where it became known in the beginning of the 18th century but entered into more general cultivation only after 1765. In introducing potatoes into Siberia and certain other outlying territories of the Russian empire multiplication was not infrequently carried out by using true seed. This was done on a quite extensive scale in the years from 1820 to 1845 by one Baĭkov, whose observations on the segregation of characters and the behaviour of the seedlings in different localities are reported verbally. Later activities on the same lines were performed by the Free Economic Society and in this way a number of well adapted local varieties arose in different parts of the country. Mention is made of the activities also of a number of amateurs such as Gračev and Oljmann and their views are quoted. The potatoes grown in Russia in the early years of the 19th century are estimated to have been about half imported and half locally-produced varieties.

Information is given on the uses to which potatoes were put in Russia in the 18th and 19th centuries.

Sizov, I. A. (*The history of flax growing in the USSR*). (*pp. 401–67*).

The author reaffirms the belief that all forms of cultivated flax comprise a single species, *Linum usitatissimum* (cf. *PBA*, XXVI, Abst. 1487), and cites evidence to show that the flax grown in Egypt in the 2nd and 3rd centuries BC belonged to a different type from that found in the European lake dwellings of the same period. The flax of ancient Colchis in the 5th century BC may have been different again and all three were probably taken into cultivation independently. Excavations dating from the early centuries AD show that flax was cultivated extensively in the various territories of ancient Russia, for both fibre and oil, in the 9th and 10th centuries. Data are given concerning the development of the flax industry in Russia in later centuries and on systems of seed exchange, whereby seed of the famous Pskov flax was sent to almost all parts of Russia. The machines adopted for the different operations of cultivation and extraction of fibre and oil are described and illustrated. Details are given also of the different types of flax now grown in the Soviet Union, together with some production figures and a brief outline of breeding work carried out since its inception in 1908. The original Pskov flax comprised a number of mixed populations and almost all the 30 varieties of linen flax now approved for cultivation in the USSR are derived from it by selection; the important role it has played in the production of improved flax varieties in many European countries, Argentina, North America and elsewhere is mentioned.

Horošaĭlov, N. G. (The history of clover cultivation in the USSR). (pp. 468–510).

Many grasses and legumes were first taken into cultivation in Russia by sowing the seeds from the hay crop, a practice that has been common since the middle of the 18th century, and citations are given which show that care was often taken to select seeds from the best meadows for the purpose. In this way a number of local strains were built up and many of the varieties produced by breeding stations in recent times have been selected from wild populations. Some of those referred to are suitable for cultivation in the extreme northern and eastern regions of the USSR. Data on clover growing in different agricultural areas of Russia in the 19th century show that most of the clovers introduced from abroad either failed or proved inferior to the local strains.

Details are given of the growth of the industry for producing clover seed in Russia in the 19th and early 20th centuries; in some areas, such as eastern Siberia and the northern areas of European Russia, the seed was raised exclusively from strains of local origin, since material introduced from abroad was immediately killed off by the severe winters. In south-western areas such as the Ukraine and White Russia the introduced clovers often survived and the populations that finally resulted arose from a complex intermixture of the introduced strains with the local wild clovers. In Soviet times over 30 selected strains, referred to as varieties, have been produced, each suited to a given locality, many of these being areas where clover cultivation is a relatively new development.

Brežnev, D. D. (History of the extension and introduction of tomato cultivation in Russia). (pp. 511–60).

The literature on the introduction of the tomato into Europe is reviewed briefly and references to its cultivation in Russia at the end of the 18th century are cited. The extension of tomato growing in the 19th and 20th centuries in different parts of Russia is outlined; it was from the start grown mainly out of doors and as its cultivation progressed into more northerly areas the process of combined natural and conscious selection led to the development of a series of hardy, early-maturing varieties adapted to different soil and climatic conditions. Some of these are described by citations from the press of the late 19th and early 20th centuries. From the descriptions it is seen that some of them bore ribbed fruits very similar to those commonly found in wild tomatoes in Peru and adjacent countries today. Many of them were the successful products of amateur breeders. Most of the varieties imported from abroad in the early years of the Soviet period proved unsuited to Russian conditions until they had been subjected to further selection; the list of varieties now approved for cultivation includes seven recommended for growing in the extreme north beyond the arctic circle, varieties specially adapted for processing, early-maturing upright varieties suitable for mechanized cultivation and forms suitable for growing under glass and in heated soil, some of them being illustrated.

Ter-Avanesjan, D. V. (History of cotton growing in the USSR). (pp. 561–622).

Gossypium herbaceum is thought to have entered Central Asia and Transcaucasia from Africa several centuries BC and has given rise there to a number of types not to be found elsewhere; these include cottons with indehiscent bolls, which have been found in Armenia, Azerbaijan and Georgia. Reference is made to attempts at cotton cultivation in different parts of Russia in the 18th and 19th centuries and the early years of the 20th, the introduction of *G. hirsutum* varieties in 1883, its gradual extension in succeeding years and the work of a number of cotton research stations in producing earlier-maturing varieties adapted to the local conditions. These included Navrockiĭ, Triumf Navrockogo [Navrockiĭ's Triumph] and a series of early-maturing Transcaucasian mixed populations bearing the name King. Later selections have been improved in uniformity, yield and quality and some in wilt resistance and earliness; in this last respect special mention is made of the variety 108-f in Central Asia and 114, 915 and 246 in Transcaucasia. Varieties such as 182, 109 and 1306 made cotton growing possible in the Ukraine, whilst other areas made available for cotton by means of improved varieties and cultural practices include the Crimea, Dagestan, the North Caucasus and the lower Volga basin; the statement is made that the USSR, which is the most northerly country where cotton is grown, also stands first in respect of yield and quality, yields of up to 50 c. of cotton per ha. being mentioned.

Čekan, I. V. (*Viticulture in the Russian state in the 17th century*). (*pp. 623–59*).

Vines were grown in the first half of the 17th century in Astrakhan, in the vicinity of the Sea of Azov and also at Kiev, where vines have been recorded from much earlier times, dating back to the 12th century; the various efforts that were made in the course of the 17th century to extend vine cultivation into other areas of Russia are related from the documents of the time; it came to be grown as far north as Moscow. The documents indicate that the material used for planting was not introduced from abroad but was of local origin, being derived probably from the wild vines that grew in the foothills of the Caucasus and the shores of the Caspian sea.

Kožin, A. E. (*History of the cultivation of subtropical plants in Western Transcaucasia*). (*pp. 660–705*).

The activities of the Suhumi botanic garden are traced from its foundation in 1840 and those of other institutions concerned with the introduction and acclimatization of subtropical plants in Russia are outlined. An account is given of the first introduction into Russia and later development of the cultivation of citrus fruits: the citron and sour orange are thought to have been grown on the Black Sea littoral since Grecian times, the lemon to have been brought there by the Turks in the 17th century and oranges at the end of the 18th; introductions from Italy and the south of France were tested in the early years of this century, together with mandarins and others from the Far East; the Unshu mandarin rapidly gained in popularity because of its hardiness. Introduction on a large scale began after 1921 and breeding work was started in 1930.

The growth of tung-oil cultivation from the first introduction of *Aleurites fordii* in 1929 to the production of 720,000 selected seedlings for planting in 1949 is traced. The olive was grown in the Crimea in prehistoric and medieval times, having been brought probably from Greece; trees of local provenance have proved more hardy than those introduced from France and other Mediterranean countries; several types exist and have given rise to selections such as Crimea 172, Nikita 1 and Nikita 2.

A number of other localities in the Caucasus and adjacent territories where olives occur, evidently as relics from the time of Greek occupation, are indicated; from the local olives of Azerbaijan a number of selections have been made; these, together with the Crimean selections, are now being used for planting in the main areas of olive cultivation and also in Turkmenia and elsewhere where olives have not previously been grown.

Kožin, A. E. (*History of tea cultivation in Russia before the October revolution*). (*pp. 706–24*).

Tea drinking was introduced into Russia in 1638, the first serious attempts to grow tea being made in the early years of the 19th century, in the Crimea; it came to be grown later in that century in Georgia and various more or less unsuccessful attempts to extend its cultivation in Transcaucasia are recounted, terminating with the collecting expedition of 1895–6 to India, Ceylon, China and Japan, as a result of which tea became firmly established as a commercial crop in the Crimea and later in Transcaucasia.

Bahtadze, K. E. (*Tea cultivation in the USSR*). (*pp. 725–47*).

Details are given of the work of the Georgian tea cooperative, founded in 1925, in organizing tea plantation and research upon it in the Georgian Republic. This included the organization of seed nurseries, which from 1932 on were able to supply all the seed required without recourse to imports from abroad. Two research institutes were opened at Čakva and Zugdidi in 1926 and 1928 respectively, and the main research institute at Maharadze in 1930. Yields were increased from 700 kg. per ha. in 1931 to 2000 kg. in 1938, the best collective farms getting up to 6000 kg. Tea cultivation has been extended also in parts of Azerbaijan, where the varieties introduced from Georgia have been subjected to selection for tolerance of more severe climatic conditions; an average yield of 345 kg. per ha. was obtained in 1948. Other areas where tea is now being grown include Krasnodar, Alma Ata, Moldavia and higher elevations in western Georgia. Some 54 thousand ha. were under tea in 1951.

BIASUTTI OWEN, E.
The storage of seeds for maintenance of viability.
Commonwealth Agricultural Bureaux, Farnham Royal 1956 : Bull. No. 43 of the Commonwealth Bureau of Pastures and Field Crops, Hurley : 20s. : Pp. v + 81 : 7 tables.

The literature on seed storage is not inconsiderable but is scattered and variable in quality so that a compilation and review of existing information has long been desirable. The present publication is concerned chiefly with the storage of small quantities of seed against loss of viability, information being given on the longevity of seeds of field, pasture and horticultural crops and some wild plants and on factors affecting their viability. As is to be expected, the review provides not only a useful survey of what is known on the subject but also reveals the many gaps in our knowledge which need to be filled. Thus, although the two principal factors affecting viability, namely moisture content of the seed, which is dependent upon relative humidity, and temperature, have been studied in some detail, more information is still required on suitable drying temperatures, optimum levels of moisture and relative humidity and the relation between dormancy and longevity.

In the chapter on Genetical aspects of seed storage, contributed by Miss T. Ashton, work on the inheritance of longevity and on mutation in aging seed is surveyed. It has been shown that risk of heritable changes increases with length of storage, but, as Miss Ashton points out, relatively little is yet known of the effects of prestorage seed treatment upon viability and hereditary constitution.

Other topics dicussed are materials and methods for drying and storing seed and the chemical changes, growth of microflora and infestation accompanying loss of viability. The bulletin concludes with a useful summary table showing the viability of crop seeds after storage for different periods under different conditions.

White, G. F. (Editor)
The future of arid lands.
Publ. No. 43 : American Association for the Advancement of Science, Washington, DC & Bailey Bros. & Swinfen, Ltd., London 1956 : 60s. : Pp. iii + 453 : figs. : tables.

This volume brings together the papers and recommendations presented at the International Arid Lands Meeting held in New Mexico, 26 April - 4 May 1955. The symposium was planned by the American Association for the Advancement of Science, financial support being given by UNESCO, the National Science Foundation of the USA and the Rockefeller Foundation. The numerous papers contributed by scientists from 17 countries and thoroughly representative of the wide range of disciplines concerned are grouped into five sections: (1) the broad view, (2) variability and predictability of water supply, (3) better use of present resources, (4) prospects for additional water sources, and (5) better adaptation of plants and animals to arid conditions. The conference should play an important part in fostering an integrated approach to the problems of regions classified as arid, which in fact constitute as much as roughly one-third of the land surface of the world.

Crop breeders will perhaps find most to interest them in the last part in which the value of genetical information in populating arid regions with suitable animals and plants receives due stress. Of the seven papers in this section, the following may be mentioned in particular. In Better adaptation of plants to arid conditions, R. M. Love includes a discussion of the physiological and genetical bases of drought resistance. Mainly with reference to experience in California, he also comments upon some ecological factors to be considered in evaluating the suitability of introductions and new types of plants. M. Evenari and D. Koller contribute Desert Agriculture: problems and results in Israel; they refer to the species found valuable, or likely to prove so, for pasture, industrial and pharmaceutical uses, sand-dune fixation and other purposes. In Problems in the development and utilization of arid land plants, L. M. Pultz emphasizes the importance of exploiting wild desert plants and of improving them by selection and breeding. He devotes some space to an account of recent investigation on the tannin-producing species *Rumex hymenosepalus*, which he gives as an example of an indigenous desert plant likely to find a useful place in the revegetation of drier areas in the United States.

Callaghan, A. R. & Millington, A. J.
The wheat industry in Australia.
Angus & Robertson Ltd., London 1956 : 63s. : Pp. 486 : 287 figs. : 56 tables.

This is the first comprehensive book on the Australian wheat industry and it is intended for agricultural students, farmers, scientific or commercial specialists and the general reader, for anyone, in fact, interested in the underlying principles and details of the production and utilization of wheat in that country. Throughout, the historical background has been given whenever possible, and the book begins with an introduction outlining relevant historical information on British agriculture and a chapter describing the establishment of agriculture in Australia, beginning with the first attempts of the penal colony in New South Wales. The next ten chapters deal with the following:

rainfall characteristics of the wheat belt; the soils on which wheat is cultivated in Australia; soil structure; soil nitrogen; phosphate deficiency and superphosphate manuring; dry farming; farming in the red-brown earth zone, the Mallee region and on other soil types; and farming for the future by the establishment of a permanent system of agriculture based on proper land usage. Chapter XII gives an account of the grain in relation to milling and baking; chapter XIII discusses wheaten bread from the standpoint of nutrition and chapter XIV provides a botanical description of the wheat plant throughout its life cycle. Breeding is considered with commendable thoroughness in the next four chapters, respectively entitled the concept of varieties, variety improvement by selection, purposeful wheat-breeding and the diseases of wheat and their control. Together these chapters give a most useful survey of early and recent work. Farm machinery receives attention in the next three chapters. The application of the f.a.q. system and other standards of grading wheat for marketing is discussed in chapter XXII, which is followed by a chapter on methods of bulk handling of the crop; three others are concerned with world trade and other economic aspects. Chapter XXVII concludes with a discussion of the relationships between the farmer and his technical advisers. The book is copiously illustrated with 287 photographs, diagrams, graphs and maps, and is well-indexed. A bibliography is included. The authors are to be congratulated upon producing an excellent up-to-date work which, with its extensive but also detailed treatment of the subject and with its awareness of the potentialities of the industry, is likely to perform the function of a standard work of reference for many years to come.

Nuttonson, M. Y.
Wheat-climate relationships and the use of phenology in ascertaining the thermal and photo-thermal requirements of wheat based on data of North America and of some thermally analogous areas of North America in the Soviet Union and in Finland.
American Institute of Crop Ecology, Washington, D.C. 1955 : Pp. vii + 388 : 154 figs. : 133 tables.

In a further monograph (cf. *PBA*, XXIV, Abst. 2830), the author analyses extensive phenological and the corresponding meteorological data concerning winter and spring wheats grown in thermally analogous areas in North America, Finland and the Soviet Union. The phenological data deal mainly with the winter wheat Kharkof in the USA, the spring wheat Thatcher in North America, the spring variety Timantti [Diamond] and winter variety Varma in Finland, and many local varieties of winter and spring wheat in the Soviet Union. The close similarity in the thermal requirements of wheats grown in North America and in analogous areas in the USSR and Finland confirmed the main conclusion of the earlier monograph: that day-degree summation offers a valuable basis for the study of phenological behaviour, the physiological-thermal classification of varieties and the choice of varieties in international exchange. The most satisfactory periods upon which to base day-degree summations (above a 40° F. base line) and predictions of times of ripening proved to be date of sowing to time of ripening in spring wheat and from March 1 to date of ripening in winter wheat. The thermal requirements of a given variety varied to some extent, according to latitude, altitude and precipitation. The analysis further indicated that for any particular variety the photothermal summation was more uniform under wide ranges of latitude, altitude and climate than the numerical expression of the day-degree requirement under similar ranges of environmental conditions.

Findlay, W. M.
Oats. Their cultivation and use from ancient times to the present day.
Oliver & Boyd, Edinburgh & London 1956 : 21s. : Pp. xi + 207 : tables.

The work of a man of wide practical experience, hard-working and energetic, who based his writing largely on personal observations and experience and who was accurate and painstaking in obtaining data and cautious in drawing conclusions, can hardly fail to be of value. The late William Findlay, says Dr. Allan Fraser in his preface, had all these qualities. They are apparent throughout this book.

The bulk of the work is concerned with the growing of the crop, particularly under Scottish conditions, and includes chapters on yield trials, seed certification, maturity, lodging, manuring and control of pests, diseases and weeds. Much of the experimental work described was carried out with varieties which have now been superseded but many of the results provide information which is valid generally and this, together with the author's extensive practical knowledge, will make the book valuable to practical agriculturists.

It is also apparent that William Findlay had a lively interest in agricultural history and tradition, for not only does the book begin, as is usual, with a chapter on the origin and early history of cultivation of oats, but it contains interesting chapters on the varieties popular at various periods from before 1800 to the present time, including an agreeable account of the wild stories current in the late eighteenth and early nineteenth century concerning the origin of the Potato oat, and many of his notes on cultural procedure are enlivened by apt quotations from Virgil and Pliny and other classical authors interested in agriculture and by references to agricultural works of the eighteenth and nineteenth century.

The last few chapters, dealing with old and new methods of drying and milling and with the nutritive value and uses of oats, include useful details on how to make good porridge, brochan, brose, oatcakes and sowans.

The book concludes with an index of varieties but, regrettably, no general subject index.

SPRAGUE, G. F.
Corn and corn improvement.
Agronomy : **5** : Academic Press Inc., New York & London 1955 : $11.50 : Pp. xiv + 699 : figs. : tables.

Maize has been the staff of life in the Americas from time immemorial and it is appropriate that this volume of the Agronomy monographs prepared under the auspices of the American Society of Agronomy should be devoted to the maize plant. Chapter 1, entitled History and origin of corn, is by P. Weatherwax and L. F. Randolph, who begin with an account of the advent of maize to the Old World, the date for this event being taken as 1494, and of its cultivation in pre-Columbian America: suggestions as to the presence of maize in Asia in those times are referred to as a mixture of "conjecture and plain nonsense," evidence for an African origin is found to be totally wanting and the view of the origin of maize presented conforms closely to that adopted in the book reviewed in *PBA*, XXV, p. 271. Cytological evidence is presented in considerable detail in support of this view: the chromosomes of teosinte are so similar to those of maize and so different from those of tripsacum that the hybrid origin of teosinte as postulated by Mangelsdorf and Reeves (cf. *PBA*, X, Abst. 760) is considered improbable; cytological studies of maize × teosinte hybrids, a more detailed study of the knobs and other features of chromosome morphology and of their association with plant characters and other evidence examined are all thought to add to the improbability and the interpretation favoured is that parallel mutation accounts for the occurrence of similar characteristics, both morphological and cytological, in *Zea*, *Euchlaena* and *Tripsacum*, which are still regarded as separate and distinct genera. Numerous cases of parallel mutants in natural populations of maize and tripsacum in Mexico are reported and it is also pointed out that *T. ancestrale*, the only South American species of this genus, is without knobs like the Andean maize; a search for spontaneous hybrids of *Zea* × *Tripsacum* in Mexico and Guatemala has failed to reveal any and crossing between *Euchlaena* and *Zea* has proved to be much less frequent than was supposed. Large numbers of hybrids between *Z. mays* and *T. dactyloides* produced artifically show no resemblances to teosinte either in the F_1 or in back-cross generations; finally there is the evidence of the fossil record: pollen grains from remains in Mexico estimated to be at least 60,000 years old having been identified as a wild species of *Zea* existing before the beginnings of agriculture, it is suggested that "more than one species might have been domesticated, possibly at different times, and in different places, and served as progenitors of modern varieties of corn." In evaluating this evidence however it would seem that the authors somewhat brush over the apparently significant fact that this ancient maize pollen occurred at a depth of over 200 ft. whereas, it is stated, no teosinte pollen was found at levels below 3·6 m. Chapter II deals with vegetative morphology, including histology, chapter III with the structure and development of reproductive organs in *Zea* and other members of the Maydeae and chapter IV, by M. M. Rhoades, with the cytogenetics of maize. The last is a review of the main results of research on chromosome morphology, and in discussing the possible role of chromosome knobs the suggestion is made that "knobs and B chromosomes play interchangeable roles in some metabolic function such as the synthesis or storage of deoxyribose nucleic acid"; it is again pointed out that there are no signs in the caryotype of present-day maize varieties of the rearrangments that would be expected on the assumption that their interstitial knobs were derived from the terminal knobs of tripsacum; the section on polyploidy includes descriptions of the trisomes and their use in chromosome mapping; B chromosomes, meiosis, the cytological demonstration of crossing over and the location of the genes are discussed; separate sections are devoted to translocation, to inversions, to deficiencies, to ring chromosomes and to abnormal chromosome

10; the last section of this chapter, dealing with mutation, considers only those mutations deemed to be of cytogenetic interest and excludes those that are "purely genetic in nature."

Corn breeding is the subject of chapter V, in which G. F. Sprague outlines the main methods of maize improvement; mass selection, varietal hybridization and ear-to-row selection are considered historically, and the various methods of using inbred lines are described; attention is given to questions such as the evaluation of inbreds, combining ability and the prediction of double-cross performance; published data on hybrids and synthetics are examined and finally, methods of recurrent selection, which is said to minimize the disadvantages inherent in other systems of breeding, are outlined. Newer achievements in the use of cytoplasmic sterility and breeding for resistance to diseases and pests and for various chemical properties are reported but the conclusion is reached that in spite of these achievements the theoretical knowledge on which further progress should be based is still largely absent and a much greater effort towards providing this knowledge is necessary if the wide possibilities for further improvement are to materialize.

Other chapters deal with more general aspects of maize cultivation, including climatic requirements, production of hybrid seed, diseases and pests. There are also special chapters dealing with popcorn and sweet corn.

Płonka, F. & Anselme, C.
Les variétés de lin et leurs principales maladies cryptogamiques. (**Flax varieties and their main cryptogamic diseases**).
Institut National de la Recherche Agronomique, Paris 1956 : 1600 frs. : Pp. 179 : figs. : tables : plates.

The first part of this detailed and highly factual account of the cultivation and utilization of flax and linseed is devoted to a comprehensive survey of morphological characters, cultural techniques, varietal differences and breeding aims and the second to descriptions of the different diseases to which *Linum usitatissimum* is susceptible and methods of control.

In the introductory chapter the first author discusses the systematics of the genus *Linum*, draws attention to the botanical features distinguishing the different species and summarizes briefly the results of research by himself and other workers on intercrossability between species. Chapter II deals with the morphological characters of the fruit, flower, seeds and stems and includes valuable information on the fibre and oil contents of some of the more important European varieties. Data on inheritance of flower colour and the geographical origins of the various genes determining flower colour are also included. In chapters III and IV the author turns to cultural techniques, environmental conditions influencing cultivation and the choice of varieties to be grown, technological properties of the fibre and cultural and varietal factors affecting the quality of the oil. In chapter V the principal varieties of fibre flax, linseed and dual-purpose flax grown in Europe, Africa, America and Asia are listed and described and mention is made of current breeding aims, with special reference to breeding work in progress at Versailles. A key to the varieties of *L. usitatissimum* grown in France and a comprehensive bibliography are also provided. In part II the second author presents a succinct and competent account, ably illustrated by photographs, of the main diseases to which *L. usitatissimum* is susceptible and provides valuable data on varietal differences in reaction to some of these diseases. Useful information on methods of control is also given and a bibliography, classified according to diseases, provides ready reference to specialized works on any particular disease.

As may be gathered from the above, the two contributors to this work have succeeded in covering almost every aspect of flax and linseed cultivation that the grower or breeder requires to know. The information given is presented in a lucid and coherent manner and the value of the publication is much enhanced by the large number of attractively coloured photographs and plates it contains. This is the first comprehensive manual on the general agriculture, varieties and diseases of flax to appear since before the war and although much of the subject matter is inevitably based on French conditions it may also be recommended without hesitation to the foreign reader.

Hopkins, J. C. F.
Tobacco diseases.
Commonwealth Mycol. Inst., Kew 1956 : 35s. : Pp. x + 178 : 91 figs. : 5 plates.

As the author himself points out this book might well appear very discouraging to the layman or new grower, giving as it does descriptions of over 40 parasitic diseases and more than half that number of diseases due to various other causes, occurring in some or all of the tobacco-growing regions of Africa. However this impression is largely dispelled on reading the book, the prevailing note being one of optimism. The author feels that control of disease is possible, except perhaps under particularly unfavourable climatic conditions, by the practice of field hygiene, seed disinfection and other methods aimed at the destruction of the parasites and at improvement of unsatisfactory environmental conditions, such as mineral deficiencies in the soil. He is concerned with effective treatment of the disease situation as it now is, rather than with the development of resistant varieties, and he has a wide practical knowledge of his subject, having visited or resided in many of the tobacco-growing areas of Africa.

The book falls into two principal sections. The first part deals with the care of seed beds and general field hygiene and gives all the practical details necessary for carrying out the treatments recommended. The second part consists of descriptions of diseases in the seed bed, in the field and in the curing barn. In the case of diseases caused by bacteria and fungi a brief technical description of the pathogen is given, followed by a detailed description of the appearance of the disease at all stages, the conditions favouring its development and methods of control. Diseases due to other causes, including physiological and deficiency diseases, are also described and treatments recommended. Many of the snags which inexperienced growers may meet are foreseen, as for instance inefficiency of labour resulting in uneven spraying or watering and the spread of mosaic by handling and by the use of snuff, chewing and smoking tobacco made from infected leaves.

Most of the diseases mentioned, and also some of the pathogens, are illustrated by means of excellent photographs; it is a pity that the five colour plates are not equally convincing. The bibliography includes about 150 papers, reference being made not only to the original publication but also to abstracts in the *Review of Applied Mycology*, where these have been made. The book is well produced and very readable, with a good index. It should prove invaluable to tobacco growers and in addition the principles outlined should serve as a guide to all concerned in the production of disease-free crops.

Krümmel, H., Groh, W. & Friedrich, G.
Deutsche Obstsorten. (**German fruit varieties**).
Deutscher Bauernverlag, Berlin 1956 : 1. Lief. : DM 14.60 : unpaginated : figs. : plates.

Accurate identification of varieties is a prerequisite for successful cultivation in any crop plant and the object of the present volume is to present descriptions of the main varieties of fruit trees grown in Germany. Separate sheets are provided for each variety, information being given concerning the correct name of the variety, synonyms if they exist, origin and sources of published information, localities in which it is grown and special cultural requirements; descriptions are given of the fruit and tree, both of which are illustrated in coloured plates. The first instalment contains colour charts for the correct interpretation of the varietal descriptions. The varieties dealt with are not confined to those of German origin and American, French, Scottish and Dutch varieties appear among the eight apples described in the first instalment, which also contains sheets for six German cherry varieties. The whole is contained in a useful loose-leaf folder.

Anderson, H. W.
Diseases of fruit crops.
McGraw-Hill Book Company, Inc., New York, Toronto & London 1956 : 64s. : Pp. vii + 501 : 94 figs.

The author, who is Professor of Plant Pathology at the University of Illinois, has compiled a text-book for research workers, teachers and practising horticulturists, giving information on the diseases of temperate fruits caused by viruses, bacteria, fungi, nematodes and physiological disturbances, mainly with reference to conditions in the United States and Canada. Four chapters are devoted to the diseases of the apple, pear and quince, and two to those attacking stone fruits; the remaining six chapters are concerned with the diseases of brambles, grapes, strawberries, gooseberries, currants, cranberry and blueberry. The discussion of each bacterial and fungal pathogen follows a definite order: history, geographical distribution, symptoms, causal organism, hosts, morphology of the pathogen, disease cycle and control. The descriptions of all types of diseases are followed by a list of selected references, conveniently inserted in the text. The introductory chapter includes a good elementary account of nematodes and their classification. In the sections on methods of control of the various diseases, the use of resistant varieties is not neglected. The illustrations, numbering nearly a hundred, have been chosen to show the symptoms of the diseases rather than the morphological details of the organisms causing them. Although the emphasis is laid upon diseases as they affect fruit cultivation in North America, this up-to-date and well-arranged book should prove useful to anyone in search of fundamental information concerning the pathology of the tree and bush fruits under consideration.

PORPÁCZY, A., SZENTIVÁNYI, P. &
BRÓZIK, S.
A dió. (**The walnut**).
Akadémiai Kiadó, Budapest 1955 : 7.50
Ft. : Pp. 76 : figs : tables : plates.

In this booklet, one of a series on the cultivated flora of Hungary, a brief outline of information on the distribution, botany and uses of the walnut, as a producer of nuts rather than of timber, is presented. Of the twenty-one short chapters, the first few deal with the history of walnut cultivation, its past and present world distribution and its occurrence in Hungary. Then comes a half-page chapter on cytology, in which the chromosome numbers of *Juglans* species and allied genera are given, and this in turn is followed by chapters on anatomy, morphology, biology of flowering, growth requirements, cultivation, methods of propagation and the disorders to which the tree is subject. Little methodical breeding appears to have been carried out yet in Hungary, but it is mentioned that good selections have been obtained from spontaneous hybrids and maintained by vegetative propagation. After a section on the chemical composition of the kernel and the commercial value of the crop, the book concludes with two short chapters on varieties, the one containing brief notes on many of the horticultural varieties known in Hungary and other countries and the other giving detailed descriptions of five registered Hungarian selections.

SYRACH LARSEN, C.
Genetics in silviculture.
Oliver & Boyd Ltd., Edinburgh 1956 :
30s. : Pp. xi + 224 : 70 figs.

Dr. Syrach Larsen, Director of the Hørsholm Arboretum, Denmark, is one of the most eminent of European forest-tree breeders. His book, which provides a general survey of the scope of forest-tree breeding, will therefore appeal immediately to all those concerned with the improvement of forest trees. Much of the material has appeared in earlier publications, in particular those referred to in *PBA*, IV, Abst. 1106, VII, Abst. 1376 and XVII, Abst. 1782, but later developments are also duly represented. The introductory chapter is followed by an historical survey of forest-tree improvement. Individual chapters are then devoted to progeny trials, pollination technique, vegetative propagation, seed production and demonstration stands. In the chapter on disease resistance, the dangers of monoclone plantations are pointed out.

The value of interspecific hybrids is discussed in chap. IX. There are a number of doubtful issues in this section, deriving largely from uncertainty as to the origin of several putative hybrids and to the naturalness or otherwise of specific distinctions in many forest-tree genera. The author is perhaps too eulogistic over the supposedly hybrid Huntingdon elm; its timber properties, at least, are not in high repute. The next chapter, entitled Genetics, is largely devoted to polyploidy.

To exemplify the principles laid down earlier in the book, the author devotes a chapter to larch breeding, in which he has had much practical experience. The final chapter, entitled Breeding and mechanization, consists of miscellaneous comments on contemporary forest-tree breeding programmes.

Dr. Syrach Larsen's book is so obviously the outcome of first-hand experience that forest-tree breeders will be well advised to acquaint themselves with it. The exposition, however, is involved and even obscure at times and strict geneticists may carp at the terms in which genetical statements are made. The translation hardly does justice to the author and appears to have been based on word-for-word, even syllable-for-syllable equivalence, løvtræ, for instance, coming out as leaf-tree instead of hardwood.

SCHMITZ-LENDERS, B.
Mein Pappel-Testament. (**My poplar testament**).
J. D. Sauerländer's Verlag, Frankfurt am Main 1956 : DM 21 : Pp. xii + 188 :
93 illus. : figs. : tables.

Written primarily to provide information both for commercial growers of the poplar and for official bodies interested in planting this tree along the Autobahnen, in the avenues of large towns or in the green belts around Germany's industrial areas, this book provides a comprehensive and up-to-date account of the many factors that have to be taken into consideration if rapid growth and satisfactory financial returns are to be assured. The writer is well known in Germany as an authority on the cultivation and systematics of the poplar—he has been a frequent contributor to such forestry journals as the *Allgemeine Forstzeitschrift*, the *Deutscher Forstwirt* and *Forst und Holz*—and in this volume, which he refers to as his legacy to future generations, he has compressed the results of a life's work on all aspects connected with the cultivation of the poplar, a tree whose economic importance has increased so rapidly in the past few decades. Here the reader will find the answers to most of the questions he is likely to raise, be they concerned with choice of species or variety, systematics or breeding, cultural techniques and the protection of the growing tree or the financial returns to be expected.

The book, which is skillfully illustrated with numerous photographs, is divided into two parts, the first dealing with the planting and care of the poplar in different habitats, the systematics of the poplar and a comparison of the merits of the different species and the second with the technological properties of the wood, the yield obtainable and financial aspects of poplar cultivation. After discussing briefly, with reference to the literature, the history of poplar cultivation in Europe, the author turns to the systematics of the genus and explains the relationship between the different species and hybrids. He then compares the Harff poplar from the Lower Rhine, which belongs to the section *Aigeiros* and is considered by the author to be the best of the German poplars, with *Populus serotina* and *P. marilandica*. A review of results obtained by selection and interspecific hybridization in different countries is then given and is followed by recommendations on cultural and planting techniques, with special reference to the Harff poplar and its resistance to diseases and snow. Part II deals with the economic aspect of poplar cultivation, gives useful information on the evaluation of wood quality and provides tables showing the financial returns that may be expected from trees of different ages and condition. An appendix gives a German translation of a work by Pelée de Saint-Maurice, published in Paris in 1769, on the cultivation of the poplar at that time; this work, which was recently discovered by Schmitz-Lenders in a private library at Harff, throws an interesting sidelight on the importance attached to the cultivation of the poplar nearly 200 years ago.

BECKER-DILLINGEN, J.
Handbuch des gesamten Gemüsebaues einschliesslich der Küchenkräuter. **(Textbook of general vegetable growing, including culinary herbs).**
Paul Parey, Berlin & Hamburg 1956 : 6th Ed. : DM 78. : Pp. xv + 755 : 253 figs : tables.

The general plan of this well-known work (cf. *PBA*, IX, p. 150) has been retained in the sixth edition but much of the text has been rewritten to bring it into line with modern developments. Additional varieties have been inserted in the varietal descriptions and many of the illustrations have been improved or replaced by new ones. The sections on breeding have been reduced and the list of literature has been suppressed altogether. The index on the other hand has been made more complete and the format is distinctly more attractive than in earlier editions.

I'SO, I.
A csicsóka termesztése és nemesítése. **(The cultivation and breeding of the artichoke).**
Akadémiai Kiadó, Budapest 1955 : 30 Ft. : Pp. 216 : 42 plates.

In England, the Jerusalem artichoke, although introduced at about the beginning of the seventeenth century, has never progressed beyond the status of the minor vegetable, nor is it much used for fodder. In Hungary, where it appeared at about the same time, it was received with rather more favour and by the early nineteenth century was sufficiently well established to have been regarded as a native crop plant, but even so only a limited amount has been cultivated. Recently, however, the crop has been found to provide an excellent source of fructose for the confectionery trade and has proved a useful material for the production of alcohol. These advantages, together with its usefulness as fresh fodder or silage and its unexacting cultural requirements, have led to such a boosting of the crop that in 1953, states the author of this work, the area under cultivation was six times as great as in 1951. It was with the aim of promoting even further interest in the cultivation of the artichoke that this book was written.

After preliminary chapters on the use and history of the crop, its taxonomy and morphology are described and discussed and a long chapter is devoted to methods of cultivation, harvesting and storage. A number of productive selections have been developed both in Hungary and in other European countries, but breeding is hampered by the plant's extremely low seed-setting ability. Interspecific crossing is said to have produced offspring more readily than intervarietal hybridization and since the crop is readily propagated vegetatively, the author regards the exploitation of heterosis as feasible. The potentialities of vegetative hybridization are also briefly touched upon. The final chapter discusses the chemical composition and nutritive value of different varieties.

Russian and French tables of contents are provided and the book concludes with indexes of scientific names, varieties and authors, a general subject index and 42 plates of illustrations.

JENSMA, J. R.
Cabbage varieties.
Instituut voor de Veredeling van Tuinbouwgewassen, Wageningen 1956 : f.13.50 : Pp. 150 : plates.

The object of this useful work is to help the seed producer to maintain varietal purity and the grower to identify varieties. In the Netherlands, as elsewhere, confusion often arises because of the large number of varieties, strains and land races that are grown: this publication, although inevitably incomplete in view of the vast amount of material at hand, should prove of considerable value in reducing the possibility of confusion in varietal identification and in enabling the seed producer to reduce the number of varieties needed to meet commercial requirements.

The 137 varieties of cabbage, red cabbage and Savoy cabbage described are arranged in order of earliness, an alphabetical list of varietal names and synonyms being provided to facilitate easy reference. A single page giving information in both English and Dutch on yield, origin, maturity, quality, morphology of the leaves and head, references to the literature and synonyms for varietal names is provided for each variety and has facing it a plate portraying the fully-grown plant and a cross section of the head. As with most Dutch publications, this work is attractively produced and the arrangement of the subject matter is excellent. It is recommended without reservation to all interested in the varietal identification and cultivation of this important horticultural crop.

FOURMONT, R.
Les variétés de pois (*Pisum sativum L.*) cultivés en France. [**Varieties of pea (*P. sativum* L.) grown in France.**]
Institut National de la Recherche Agronomique, Paris 1956 : 1600 frs. : Pp. 253 : figs. : tables : plates.

In this book, the first of a series intended to cover the main types of vegetable grown in France, the author gives us the benefit of his extensive knowledge and wide experience of the systematics of the genus *Pisum* and presents a new system of classification of pea varieties cultivated in France, based upon length of stalk, colour and shape of the leaves, shape of the leaflets and stipules, morphology of the inflorescence and flower, and shape, colour and starch content of the seed. Although intended primarily as a work of reference for gardeners, farmers and canners to asist them in varietal identification and to help them choose the variety best suited for their commercial objectives and local conditions, this book should also prove of considerable value to students of agriculture and all interested in a scientific study of the origin, evolution and agronomic importance of *P. sativum*.

The first part of the book begins with an account of the spread of the cultivated pea from its primary centres of origin in Afghanistan and Abyssinia to its secondary centre in the Mediterranean basin and with an historical survey of its agronomic importance, documented by references to the literature and the discovery of fossil remains, in the Ancient World and in the Middle Ages. The author then turns to the cultivation of *P. sativum* in Europe at the present time, discusses climatic and other influences affecting the area of cultivation and the type of pea grown and deals with the question of the classification of types and varieties, with frequent reference to research by other authors. The second part of the book is devoted to a detailed study, amply illustrated by drawings and photographs, of the morphological characteristics of the different varieties of pea and mention is made of the genetical basis of some characters and factors, such as earliness, suitability for canning and resistance to diseases and insects, of importance to the grower. Varieties included in the French list of approved varieties are described in minute detail and are classified according to their morphological characteristics. Plates illustrating the morphology of the flowers, stipules, leaflets, pods and seeds of each variety then follow, showing very clearly the wide range of varieties in existence and the often considerable differences between them. In conclusion, colour plates are provided to bring out varietal differences in the colour of the foliage and synonyms for varietal names are given. A genealogical table giving the origin of the principal varieties grown in France during the past two hundred years and their interrelationships as well as an alphabetical index of varieties and synonyms and a comprehensive bibliography are also provided.

The author is to be congratulated on his meticulous attention to detail and on the great care that he has clearly devoted to this work. Reference to the wealth of detail it contains is facilitated by ingenuity in arrangement and the attractiveness of the book as a whole is considerably enhanced by the large number of illustrations and sketches that are provided.

NEW JOURNALS

Cereal Science Today

The above journal, which is published by the American Association of Cereal Chemists, is to replace *AACC Transactions and Cereal News*, formerly published by the association. The new publication is to contain articles, intended for both the scientist and nonscientist, on developments in cereal chemistry and technology in government, academic and industrial laboratories in the USA. Items in the first issue in May 1956 include the articles Frozen bakery products by W. H. Cathcart and Atoms strike the cereal industry by R. Pomerantz. The journal is published ten times a year (monthly except in June and August). Editorial Offices and Circulation Department: University Farm, St. Paul 1, Minnesota. Annual subscription, $3.00.

New Gold Coast Farmer

Issue of the journal previously published by the Gold Coast Department of Agriculture, under the title *The Gold Coast Farmer*, ceased with the outbreak of the second world war. *New Gold Coast Farmer*, the first number of which appeared in August 1956, is being published to keep officials of the now much larger Department in touch with the complete range of activities undertaken by this organization and to provide information on problems and developments for local farmers and for agriculturists in other tropical countries. The journal is published quarterly; price per copy, 1s. 3d. Further information may be obtained from the Department of Agriculture, Accra, Gold Coast.

THE COMMONWEALTH BUREAU OF PLANT BREEDING AND GENETICS,
School of Agriculture, Cambridge, England.

Consultant Director:
PROF. SIR FRANK L. ENGLEDOW, C.M.G., M.A., F.R.S., Drapers' Professor of Agriculture.
Director: P. S. HUDSON, Ph.D.
Assistant Director: R. H. RICHENS, M.A.
Assistants: MISS T. ASHTON, M.A.
B. E HEISELER.
Miss O. HOLBEK, B.Sc.
A. H. WELSH, M.A.
Miss S. M. LITTLEBOY, M.A.

Publications:

PLANT BREEDING ABSTRACTS.

Issued quarterly. Subscription 70/-, with Subject Index. (Subscriptions for current volumes sent direct from within the British Commonwealth of Nations are subject to a reduction of 20%.) Single copies 20/- each.

Copies of "Plant Breeding Abstracts" printed on one side of the paper can be supplied, for the convenience of readers wishing to cut up and file the references, at an additional cost of 15/- per volume.

Important Note.—Every effort is made to make Plant Breeding Abstracts as complete as possible and its notices of papers referring to plant breeding or the genetics of crop plants as prompt as possible. To aid in this, authors are invited to send to the Director copies of their papers immediately on publication.

Other Publications:

JOINT PUBLICATIONS	*s.*	*d.*
No. 3. The Breeding of Herbage Plants in Scandinavia and Finland	4	0
No. 5. The Production of Seed of Root Crops and Vegetables	5	0
No. 8. Forest Tree Breeding and Genetics, by R. H. Richens	5	0
TECHNICAL COMMUNICATIONS		
4. An Outline of Cytological Technique for Plant Breeders	2	6
6. The Action and Use of Colchicine in the Production of Polyploid Plants, by J. L. Fyfe	1	6
7. Field Trials: their Lay-out and Statistical Analysis, by John Wishart ..	2	6
9. Potato Collecting Expeditions in Mexico and South America. II. Systematic Classification of the Collections, by J. G. Hawkes	7	6
10. Photoperiodism in the Potato, by C. M. Driver and J. G. Hawkes ..	2	6
11. Cultivation and Breeding of Russian Rubber-bearing Plants	2	6
12. The New Genetics in the Soviet Union, by P. S. Hudson and R. H. Richens	6	0
13. The Use of Heterosis in the Production of Agricultural and Horticultural Crops, by Miss T. Ashton	3	0
14. Technique of Breeding for Drought Resistance in Crops, by Miss T. Ashton	2	6

TECHNICAL COMMUNICATIONS—*continued.*	*s.*	*d.*
15. Field Trials II: The Analysis of Covariance, by J. Wishart	3	6
16. The Theory and Practice of the Backcross Method in the breeding of Noncereal Crops, by Mrs. M. Thomas ..	15	0
17. Abstract Bibliography of Cotton-Breeding and Genetics, 1900–1950, by R. L. Knight	21	0
18. Principles and Practice of Field Experimentation, by J. Wishart and H. G. Sanders. 2nd Edition	21	0
New and Promising Varieties recently described in the Literature (Issues 4 and 6) .. .. each	1	0
Issue No. 7	2	6
Issue No. 8	6	0
INDEXES		
Subject Index to Vols I to V of Plant Breeding Abstracts	20	0
Subject Index to Vols VI to VIII of Plant Breeding Abstracts	20	0
Subject Index to Vols IX-XXV of Plant Breeding Abstracts .. .. each	20	0
BIBLIOGRAPHICAL MONOGRAPHS		
Breeding varieties resistant to disease. (1930)	2	0
Bibliography on insect pest resistance in plants. (1944)	1	6
Bibliography of Baking Quality Tests. Supplement	1	6

Subscriptions to any of the above Publications should be sent to Commonwealth Agricultural Bureaux, Central Sales Branch, Farnham House, Farnham Royal, Nr. Slough, Bucks, England.

Loss in Transit.—Claims for numbers of Plant Breeding Abstracts lost in transit will only be considered if notice of such loss is received within three months of the date of posting.

COMMONWEALTH AGRICULTURAL BUREAUX

JOURNALS PREPARED BY BUREAUX ON RELATED SUBJECTS

	Prepared by the
Herbage Abstracts (50/-)	Commonwealth Bureau of Pastures and Field Crops, Hurley.
Field Crop Abstracts (50/-)	Commonwealth Bureau of Pastures and Field Crops, Hurley.
Horticultural Abstracts (70/-)	Commonwealth Bureau of Horticulture and Plantation Crops, East Malling.
Soils and Fertilizers (60/-)	Commonwealth Bureau of Soil Science, Harpenden.
Forestry Abstracts (70/-)	Commonwealth Forestry Bureau, Oxford.

The annual subscription to the above journals is indicated in brackets; a special reduction of 20 per cent is given for orders for current volumes received direct from subscribers in Great Britain, the Dominions and Colonies.

RECENT AND FORTHCOMING OCCASIONAL PUBLICATIONS ON AGRICULTURE AND FORESTRY

C.A.B. REPORTS AND DIRECTORIES

Gazetteer of Agricultural and Forestry Research Stations in the British Commonwealth. (1952)	30s. 0d.

C.A.B. JOINT PUBLICATIONS

No.		
10.	The Use and Misuse of Shrubs and Trees as Fodder. Commonwealth Bureaux of Pastures and Field Crops and Animal Nutrition and Commonwealth Forestry Bureau. 1947	9s. 0d.
12.	Phenothiazine 1942-46: A review and bibliography. 1948	4s. 0d.
13.	Pregnancy diagnosis tests: A review. A. T. Cowie. 1948	15s. 0d.
14.	The establishment of vegetation on industrial waste land. By R. O. Whyte and J. W. B. Sisam	10s. 0d.

TECHNICAL COMMUNICATIONS, ETC.

Commonwealth Bureau of Pastures and Field Crops, Hurley.

40.	The production and utilization of Silage. A survey of world Literature in Abstracts	10s. 0d.
41.	Management and Conservation of Vegetation in Africa. 1951	10s. 6d.
42.	Methods of surveying and measuring vegetation. By Miss D. Brown ..	35s. 0d.

Commonwealth Bureau of Horticulture and Plantation Crops, East Malling.

22.	Sand and water culture methods used in the study of plant nutrition. By E. J. Hewitt. 1952	42s. 0d.
23.	Field experimentation with fruit trees and other perennial plants. By S. C. Pearce. 1953	10s. 0d.

Commonwealth Bureau of Soil Science, Harpenden.

47.	Laterite and lateritic soils. By J. A. Prescott and R. L. Pendleton. 1952	6s. 0d.
48.	The trace-element content of soils. By D. J. Swaine. 1955	25s. 0d.
49.	Mulching. By G. V. Jacks, W. D. Brind and R. Smith. 1955	15s. 0d.

The above publications are obtainable from Commonwealth Agricultural Bureaux, Central Sales Branch, Farnham House, Farnham Royal, Nr. Slough, Bucks, England.

Commonwealth Mycological Institute, Kew, Surrey.

An introduction to the taxonomy and nomenclature of fungi. By G. R. Bisby. 1953	10s. 0d.
Tobacco diseases, with special reference to Africa. By J. C. F. Hopkins	35s. 0d.

PRINTED BY W. HEFFER & SONS LTD., CAMBRIDGE, ENGLAND